

1-1-1992

The effect of canteen menu on nutritional knowledge, attitudes and behaviour of year five students

Sharon McBride
Edith Cowan University

Follow this and additional works at: <https://ro.ecu.edu.au/theses>



Part of the [Nutrition Commons](#)

Recommended Citation

McBride, S. (1992). *The effect of canteen menu on nutritional knowledge, attitudes and behaviour of year five students*. <https://ro.ecu.edu.au/theses/1128>

This Thesis is posted at Research Online.
<https://ro.ecu.edu.au/theses/1128>

Edith Cowan University

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study.

The University does not authorize you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following:

- Copyright owners are entitled to take legal action against persons who infringe their copyright.
- A reproduction of material that is protected by copyright may be a copyright infringement. Where the reproduction of such material is done without attribution of authorship, with false attribution of authorship or the authorship is treated in a derogatory manner, this may be a breach of the author's moral rights contained in Part IX of the Copyright Act 1968 (Cth).
- Courts have the power to impose a wide range of civil and criminal sanctions for infringement of copyright, infringement of moral rights and other offences under the Copyright Act 1968 (Cth). Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

THE EFFECT OF CANTEEN MENU ON
NUTRITIONAL KNOWLEDGE, ATTITUDES AND BEHAVIOUR
OF YEAR FIVE STUDENTS

By

Sharon McBride B.Ed. (Hons.)

A Thesis Submitted in Partial Fulfilment

of the

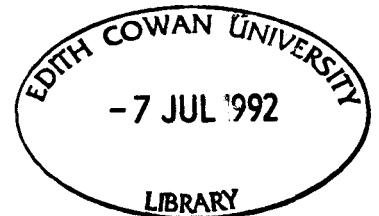
Requirements for the Award

of

Master of Education

at the School of Education,

Edith Cowan University



USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

ABSTRACT

Eating habits are learned during childhood, and patterns of behaviour established in childhood have important health ramifications throughout life. Over half of all deaths in Australia are linked to diet with over-consumption of saturated fat, sugar and salt, and lack of fibre being identified as particular problem areas. Nutrition education is an important component of primary health education curricula, and yet school canteens, an integral part of the school environment, do not necessarily offer healthy food choices that support nutrition instruction in the classroom.

This study investigated the effect of canteen menu on student knowledge and attitudes toward nutrition and dietary behaviour at school. A two-part questionnaire and dietary analysis were administered to Year Five students in six metropolitan government primary schools. Schools were selected to form one of three groups; those with canteens that sold predominately healthy food, those that did not, and those that changed to selling predominately healthy food during the study period. A pretest was administered at the beginning of the study and were followed with a post-test after a five month period.

Differences between groups were apparent in dietary behaviour and attitudes towards nutrition. Students with access to canteens with a healthy menu consumed less fat , less salt and more fibre while at school compared with students in schools where the

menu was nutritionally inferior. The analysis of the attitudinal section of the questionnaire revealed several differences in student opinion about nutrition. In general, those students with access to healthy canteen menus displayed more positive attitudes towards good nutrition. Use patterns of the canteens and knowledge about nutrition were similar for each group.

The study revealed that the nature of canteen food is an important influence on dietary behaviour at school. In addition, it appears that the canteen menu may affect students' attitudes toward good nutrition. This influence may have important ramifications for the present and future health of young Australians and warrants careful consideration by decision-making authorities.

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference has been made in the text.

Signature.

Date. . . 18/3/92

ACKNOWLEDGMENTS

I wish to express my appreciation to many people who provided guidance and assistance during this project.

To the Education staff at the National Heart Foundation (WA Division), especially Glenn Cardwell, Frances Honig, Pam Lincoln, Andrew Jones-Roberts and Trevor Shilton.

To Amanda Blackmore and Steve Simpson of Edith Cowan University.

To Robin Bromley, Lecturer in the School Canteen Management Course at Bentley College of Technical and Further Education.

To Jean Antrobus and Ronlea Chick.

To the teachers and students at the six study schools and at the two pilot schools.

To family and friends, especially to husband Rod Annear.

Special thanks to supervisors Jenny Browne and Ken Burns.

TABLE OF CONTENTS

	Page
ABSTRACT	ii
DECLARATION	iv
ACKNOWLEDGMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	ix
TERMS OF REFERENCE	xiii
Chapter	
1 INTRODUCTION	1
Background to the Problem	1
Research Overview	3
Research Questions	4
2 LITERATURE REVIEW	5
Diet and Cardiovascular Disease	5
Diet and Children: The Influences	9
Health Promotion in the School	11
Classroom Nutrition Education	12
Environmental Factors in the School	14
Policy and Practice in School Canteens	18
Canteens in Western Australia	21
Summary	23

3	METHODOLOGY	25
	Conceptual Framework	25
	Research Design	27
	Instrumentation	28
	Pilot Testing	31
	Selection of a Study Population	33
	Data Collection	38
	Data Processing and Analysis	40
	Assumptions	42
	Limitations	43
	Summary	44
4	ANALYSIS OF RESULTS	46
	Analysis of the Pretest Results	46
	Use of the canteen	46
	Knowledge about nutrition	48
	Dietary behaviour	48
	Attitudes towards nutrition	53
	Findings	56
	Analysis of the Post-test Results	58
	Use of the canteen	58
	Knowledge about nutrition	59
	Dietary behaviour	59
	Attitudes towards nutrition	64
	Findings	67

	Differences Between Pretest and Post-test	69
	Use of the canteen	69
	Knowledge about nutrition	70
	Dietary behaviour	71
	Attitudes towards nutrition	76
	Findings	78
5	DISCUSSION	80
6	SUMMARY AND RECOMMENDATIONS	89
	APPENDIX A	93
	APPENDIX B	101
	APPENDIX C	104
	APPENDIX D	106
	APPENDIX E	123
	REFERENCES	129

LIST OF TABLES

Table	Page
1. Pretest sample population by group and by gender	33
2. Use of the canteen on the day of the pretest	47
3. Normal weekly canteen use (Pretest)	48
4. Selected nutrients for "at school" diet by group means (Pretest)	49
5. Mean percentage of total energy from fat for canteen users and non-canteen users (Pretest)	50
6. Mean fibre intake for canteen users and non-canteen users (Pretest)	51
7. Mean sodium intake for canteen users and non-canteen users (Pretest)	52
8. Mean sugar intake of canteen users and non-canteen users (Pretest)	52
9. Summary of attitude section (Pretest)	53
10. Use of the canteen on the day of the post-test	58
11. Normal weekly canteen use (Post-test)	59
12. Selected nutrients for "at school" diet by group means (Post-test)	60
13. Mean percentage of total energy from fat for canteen users and non-canteen users (Post-test)	61
14. Mean fibre intake for canteen users and non-canteen users (Post-test)	62

15. Mean sodium intake for canteen users and non-canteen users (Post-test)	63
16. Mean sugar intake of canteen users and non-canteen users (Post-test)	64
17. Summary of attitude section (Post-test)	64
18. Use of the canteen on the days of data collection (Post-test in parenthesis)	69
19. Normal weekly use of the canteen (Post-test in parenthesis)	70
20. Mean knowledge test scores (Post-test in parenthesis)	70
21. Mean percentage of total energy from fat for "at school" diet	71
22. Mean percentage of total energy from fat, canteen users and non-canteen users (Post-test in parenthesis)	72
23. Mean fibre intake for "at school" diet	72
24. Mean fibre intake for canteen users and non-canteen users (Post-test in parenthesis)	73
25. Mean sodium intake for "at school" diet	74
26. Mean sodium intake for canteen users and non-canteen users (Post-test in parenthesis)	74
27. Mean sugar intake for "at school" diet	75
28. Mean sugar intake for canteen users and non-canteen users (Post-test in parenthesis)	75
29. Summary of differences between tests for attitude section	76
30a. Responses to "I like to eat healthy food" (Pretest)	106
30b. Responses to "I like to eat healthy food" (Post-test)	106

31a. Responses to "Most kids who are overweight can't help it"	
(Pretest)	107
31b. Responses to "Most kids who are overweight can't help it" (Post-	
test)	107
32a. Responses to "I enjoy eating fresh fruit and vegetables" (Pretest)	108
32b. Responses to "I enjoy eating fresh fruit and vegetables" (Post-test)	108
33a. Responses to "School canteens should sell healthy food" (Pretest)	109
33b. Responses to "School canteens should sell healthy food" (Post-test)	109
34a. Responses to "I enjoy eating lollies and take-away foods" (Pretest)	110
34b. Responses to "I enjoy eating lollies and take-away foods" (Post-	
test)	110
35a. Responses to "I like cool drinks better than fruit juices" (Pretest)	111
35b. Responses to "I like cool drinks better than fruit juices" (Post-test)	111
36a. Responses to "My eating habits are healthy" (Pretest)	112
36b. Responses to "My eating habits are healthy" (Post-test)	112
37a. Responses to "Food in our canteen is healthy" (Pretest)	113
37b. Responses to "Food in our canteen is healthy" (Post-test)	113
38a. Responses to "Normal milk is healthier than low fat milk" (Pretest)	114
38b. Responses to "Normal milk is healthier than low fat milk" (Post-	
test)	114
39a. Responses to "We should learn about healthy eating at school"	
(Pretest)	115
39b. Responses to "We should learn about healthy eating at school"	
(Post-test)	115

40a. Responses to "I don't like eating fatty foods" (Pretest)	
40b. Responses to "I don't like eating fatty foods" (Post-test)	116
41a. Responses to "If I have a choice, I choose healthy foods" (Pretest)	116
41b. Responses to "If I have a choice, I choose healthy foods" (Post-test)	117
42a. Responses to "I like to buy food from the canteen" (Pretest)	117
42b. Responses to "I like to buy food from the canteen" (Post-test)	118
43a. Responses to "Most people who are overweight are as healthy as people who are not overweight" (Pretest)	118
43b. Responses to "Most people who are overweight are as healthy as people who are not overweight" (Post-test)	119
44a. Responses to "I like to buy healthy food from the canteen" (Pretest)	119
44b. Responses to "I like to buy healthy food from the canteen" (Post-test)	120
45a. Responses to "I like to sprinkle salt on my food" (Pretest)	120
45b. Responses to "I like to sprinkle salt on my food" (Post-test)	121
46a. Responses to "Take-away food can be just as healthy as other food" (Pretest)	121
46b. Responses to "Take-away food can be just as healthy as other food" (Post-test)	122

TERMS OF REFERENCE

Atherosclerosis. A disease characterised by thick and irregular fatty deposits on the inner layer of the artery wall. These deposits interfere with normal blood and the nourishment of the tissues (American Heart Association, 1980).

At school diet. Foods consumed by students while at school including food purchased from the canteen and food brought from home.

Canteens. Food service outlets in schools.

Canteen users. Those students who purchased one or more items from the canteen.

Cholesterol. A white, waxy, fat substance found in all animal tissues. Excessive cholesterol production encourages the development of heart and blood vessel diseases.

Cardiovascular disease. A group of diseases that affect the heart and blood vessels.

Health education. That section of the school curriculum that focuses on positive adaptations to health.

Health Education K-10 Syllabus. The Western Australian health education syllabus designed for school children from pre-primary to Year Ten.

Health promotion. Organisational, political and economic interventions, including health education, that improve or protect health (Bates and Wynder, 1984).

Lipoproteins. Fat carrying particles in the blood.

Non-canteen users. Those students who did not buy items of food from the canteen.

Primary prevention. Education interventions which precede the onset of signs and symptoms, or risk factors of disease.

Recommended Dietary Goals. Levels of nutrient intake that are suggested as dietary aims.

Saturated fats. Fats that are mostly of animal origin. Foods rich in saturated fats tend to increase blood cholesterol levels.

CHAPTER 1

INTRODUCTION

Background to the Problem

Poor eating habits are a major cause of death and disability in Australia. Diet can influence the onset of cardiovascular disease, some cancers, and diabetes mellitus, as well as iron deficiency anaemia, dental caries and a range of digestive disorders (Australian Health Ministers' Advisory Council, 1988). Cardiovascular disease alone results in 46% of all death in this country (National Heart Foundation, 1989).

Patterns of dietary behaviour are established in childhood and therefore primary prevention should begin in childhood (Gliksman, Dwyer and Boulton, 1987). In Western Australian schools there exists a comprehensive health education curriculum, the Health Education K-10 Syllabus. The curriculum is of a spiral nature; understandings are introduced at pre-primary level and are further developed in following years, introducing increasingly complex and sophisticated variations of the concept. The area of nutrition is covered in at least 18 objectives ranging from pre-primary to Year Ten. Suggested activities have been designed to encourage development of knowledge about health, positive attitudes towards health, and personal skills to promote personal health. The ultimate goal is to affect healthy behaviour among students (Education Department of Western Australia, 1986).

It is recognised that school health education programs are most effective when supported by school health policy and organisational change (Hochbaum, 1981, Hinkel,

1982, Nutbeam, Clarkson, Phillips, Everett, Hill & Catford, 1987, Parcel, Simons-Morton, O'Hara, Baranowski, Kolbe & Bee, 1987, National Health and Medical Research Council, 1988 and Allen & Amanatidis, 1990). Nutrition education programs will effect greater behavioural change when school food services reflect the messages being conveyed in the classroom.

No thorough research has been carried out to assess the nutritional value of food provided in Western Australian school canteens. There are indications that many canteens sell food that is high in fat, salt and sugar and low in dietary fibre. Bailes (1982) stated that food purchased from school canteens constitutes up to a third of children's dietary food intake. Therefore, food sold in school canteens which is nutritionally unsound is likely to have a significant impact on the present and future health of many school children.

In Western Australia, school parents' associations are responsible for the operation and management of school canteens (Health Department of Western Australia and Ministry of Education, 1987). Little guidance has been forthcoming regarding nutritional aspects of canteen food, with the exception of the Guiding Principles document, a joint initiative of the Ministry of Education and the Health Department of Western Australia, 1987. However, *Nutrition Link* (1988) reported that this document has been of limited value and consequently there is still considerable variation in the type of food provided by canteens around the State. Many schools rely on volunteer labour to operate the canteen and as a result, expedience and convenience are sometimes of greater importance than good nutrition. In addition, parents' associations often rely on the

canteen to generate considerable profit, and a common misconception is that profit and good nutrition are incompatible (Victorian School Canteens' Association, 1988).

Research Overview

This study focuses on Year Five students at six government primary schools in metropolitan Perth. These students have benefited from several years of classroom nutrition education, but with varying environmental support from the school canteen. Students were categorised into three groups as follows:

HE (Healthy) Students who attended a school where the canteen menu offered predominately healthy food choices.

CH (Change) Students who attended a school where the canteen menu did not offer predominately healthy food choices but which changed to a healthier menu during the study period.

CO (Control) Students who attended a school where the canteen menu did not offer predominately healthy food choices.

NOTE: Judgements made about the nutritional value of food were based upon the Dietary Guidelines for Australians (Commonwealth Department of Health, 1988).

Students completed a pretest to investigate knowledge about nutrition, attitudes towards nutrition and current dietary behaviours at school. An identical post-test was administered five months later.

Research Questions

1. In what ways does the canteen menu affect the use of the canteen?
2. Does the canteen menu affect student knowledge about nutrition?
3. In what ways does the canteen menu affect the food that children eat at school?
4. Does the canteen menu affect student attitudes towards nutrition?
5. Does a change in canteen menu affect
 - a) the food children eat?
 - b) the use of the canteen?
 - c) attitudes towards nutrition?
 - d) knowledge about nutrition?

CHAPTER 2

LITERATURE REVIEW

This review begins by addressing the general areas of diet and cardiovascular disease and the factors that influence a child's diet. The area of health promotion in the school is investigated, and then two important areas of school health promotion are explored in more depth, namely classroom nutrition education and environmental considerations in the school situation. School canteens are specifically identified as an important environmental factor. The review concludes with an examination of the policy and practice of school canteens with a focus on canteens in Western Australia.

Diet and Cardiovascular Disease

Cardiovascular disease causes 46.0% of all deaths in Australia (National Heart Foundation, 1988) and is by far the largest cause of death in Australia. Parcel et al. (1987) indicated that the figure is similar in the United States of America. Epidemiological research has identified the important risk factors for cardiovascular disease. Downey, Virgilio, Serpas, Nicklas, Arbeit, and Berenson (1988) listed the risk factors as elevated blood pressure, smoking, elevated serum lipids and lipoproteins, dietary fat intake, inactivity, heredity and obesity.

Recent health promotion efforts have focussed on these risk factors. The National Heart Foundation (1989) stated that reductions in mortality as a result of cardiovascular disease have occurred during the past decade. In the United States of America, a similar

reduction has occurred (Downey et al. 1988), but in both countries cardiovascular disease is the leading cause of death and a major public health problem.

Glanz and Mullis (1988) and Simons-Morton, Parcel and O'Hara (1988) stated that good nutrition is related to many positive outcomes for individual health. The risk of many chronic diseases such as cardiovascular disease, certain cancers and diabetes are substantially reduced when a healthful diet is maintained. Simon-Morton et al. specified that people should avoid excessive calories, reduce the total amount of fat in the diet and particularly saturated fats, reduce sodium intake and increase fibre intake. Governments in Australia and the United States of America have recommended population-wide changes, and dietary guidelines have been established. The Commonwealth Department of Health has developed a set of dietary guidelines and those relevant to school canteens are as follows:

1. Choose a nutritious diet from a variety of foods.
2. Control your weight.
3. Avoid eating too much fat.
4. Avoid eating too much sugar.
5. Eat more bread and cereals, fruit and vegetables.
6. Use less salt.

(Commonwealth Department of Health, 1988).

Glanz and Mullis (1988) proposed that healthy dietary behaviour needs to be long term and some benefits are not obvious to the individual at all. Blood cholesterol reduction is a desirable condition, but there is often no obvious benefit to the individual and it is

also difficult to monitor. Therefore changes to diet can be difficult to achieve for the unmotivated person.

Moller (1982) and Parahoo (1984) stated that the symptoms of cardiovascular disease usually do not become manifest until middle age, although the atherosclerotic process begins at a much earlier age. Parahoo noted that within economically privileged countries, people as young as five years of age have already developed abnormalities in their coronary arteries, and signs of atherosclerosis can frequently be found in five or six-year-olds. Numerous other researchers maintain that the signs of cardiovascular disease are evident from childhood (Perry, Mullis & Maile, 1985, Gliksman et al., 1987, Nutbeam et al., 1987, Simons-Morton et al., 1988, Downey et al., 1988, Allen & Amanatidis, 1990.)

Downey et al. (1988) reported on the Bogalusa Heart Study, an ongoing epidemiological investigation of 8,000 children in Louisiana. The study has enabled the compilation of a data bank of cardiovascular risk factors in children during the past twelve years. It revealed that precursors of heart disease begin at an early age, some children exhibiting multiple risk factors including hypertension and elevated lipoprotein levels. As with adults, the clustering of risk factors puts the child at greater risk. In addition, Downey et al. stated that in identifying risk factors in children, predictions can be made about their risk of adult cardiovascular disease.

Schoenberger (1982) and Moller (1982) stated that educational efforts should focus on children. Although public education has resulted in some people making healthy

lifestyle changes, education about cardiovascular health is more useful among children. Schoenberger outlined three main reasons why children will benefit from educational effort. Firstly, risk factors are probably the same for children as for adults. Secondly, adults are resistant to change. It is easier to motivate children not to start smoking or to maintain an ideal weight rather than to change those risk factors in adults. Finally, the atherosclerotic process is reversible up to a point, therefore the earlier the intervention the better.

Downey et al. (1988) argued that cardiovascular disease intervention and health promotion must begin in early life. They proposed that children need to acquire the necessary knowledge, attitudes and skills in order to promote cardiovascular health at an early age when health habits are being established.

Parcel et al. (1987) reported on a three year health promotion project carried out in the United States of America, which involved the implementation of policies and practices to support a healthy diet and physical activity. The project goal was to reduce cardiovascular risk factors among the sample population. It was concluded that diet and physical activity patterns were learned early in life and that interventions should promote good habits that will continue on to adulthood. The program entailed classroom instruction and organisational changes to the school environment that would reinforce the classroom material.

Numerous other authors from Australia, Britain and the United States of America supported the early promotion of cardiovascular health (Perry et al., 1985, Nutbeam

et al., 1987, Simons-Morton et al., 1988, Allen & Amanatidis, 1990). In Australia, Gliksman et al.(1987) reported that daily physical activity, reduced intake of saturated fats, and smoking intervention have significantly favourable effects on reducing serum lipids and blood pressure levels in children. They added:

... from early childhood onwards there exists a continuum for the effect of risk factors on coronary heart disease. Because of this, debate has centred increasingly around the need for primary prevention in childhood (p. 360).

Diet and Children: The Influences

The eating habits of children evolve by contact with a number of complex influences. The school canteen and the school environment are but a part of the total picture. Gillespie (1981) developed a theoretical framework to describe the influences on children's knowledge, attitudes and behaviour as they related to nutrition. He divided the influences into three main categories; home and family environment, school environment, and community environment. Within the home and family environment, the child is influenced by the parents' nutrition knowledge, beliefs and attitudes towards nutrition and food preferences. The dynamics of the home eating situation and sibling food preferences are also important. Within the school environment, teachers, peers, administrators and food service personnel (canteen staff) all influence the child. The food services and lunchroom practices (corresponding to the canteen in Australian schools) are an important influence. Of the community environment, Gillespie noted

that characteristics such as urbanisation, economic status, food availability, community norms and advertising are influential.

Hochbaum (1981) argued that social, economic and environmental factors are important influences on food selection. Knowledge of health and even motivation to change, is not enough to promote healthy habits. The change will not occur if social, economic and environmental conditions are not conducive to change. "Ample and convincing evidence that knowledge of what constitutes good nutrition by itself has only limited, if any, effect on nutrition related practices" (p. S50). Of the factors that influence diet, Hochbaum stated:

.... the great majority of people are guided in their food selections by considerations totally unrelated to health; by their own and their family's taste preferences, by cost, by convenience, by the lures of advertising and store displays, and so forth (1981, p. S51)

Glanz and Mullis (1988) supported Hochbaum (1981) and Gillespie (1981) by specifying family and group situations, food preparation and consumption, socio-economic status, economic change, culture, geography and food availability as factors that influenced a child's dietary patterns.

Health Promotion in the School

The literature highlights the importance of nutrition education in schools. Perry et al. (1985) stated there is sufficient evidence concerning the development of disease risk factors during childhood to warrant development of education programs. Nutbeam et al. (1987) viewed school health promotion as particularly valuable because: it is a cost effective way of reaching most of the population; schools have a clear mandate; and schools can directly influence people through education and organisation change (p.152). Simons-Morton et al. (1988) agreed adding that schools are in a unique position to influence the diet of children.

Nutbeam et al. (1987) described a "health promoting" school as one that balances the effort of curriculum, environment and outreach. More specifically, school curriculum, organisation and policy, mass media, professional training for teachers, education programs involving parents and the home situation, other networks e.g. sports, clubs, and macro-environment (supply and promotion of products) contribute to nutrition education.

Schools can influence not only their students, but can incorporate their families in the educational process (Ellison, Capper, Goldberg, Witschi & Stare, 1988). Parents can be asked specifically to assist in their child's homework and to take an active role in their child's nutrition education, and involvement in such programs may even stimulate modification of disease risk factors in the parents. Cameron, Mutter and Hamilton (1991) reinforced the views of others in saying:

For at least two decades, the professional literature has advocated a comprehensive approach to school health programs as a logical, effective means of promoting children's health and preventing later health problems. Such an approach coordinates three basic components: instruction, services and environment. This means our schools must go beyond merely instructing children about health (p.2).

Classroom Nutrition Education

The usual approach for cardiovascular risk modification in schools is through curriculum programs. Ellison et al. (1988) suggested that lessons should incorporate activities to develop student knowledge, attitudes and behaviours which relate to cardiovascular risk factors. Shannon and Chen (1988) agreed that school-based nutrition education programs offer an avenue for influence in student knowledge, attitudes and behaviour. As childhood is a critical time for immediate and long term nutritional well-being, these program components will encourage modifications in behaviour that will extend into adulthood. Most schools in the United States of America involved classroom instruction, with the emphasis on developing cognitive, affective and skill outcomes (Parcel et al., 1987). Other reports note the importance of knowledge, attitude and behavioural components of classroom nutrition education (Downey et al., 1988, Gillespie, 1981, Education Department of Western Australia, 1986).

Shannon and Chen (1988) conducted a three year study in twelve school districts in Pennsylvania. Nutrition knowledge, attitudes and self-reported eating behaviour were tested in both control and treatment groups. The treatment groups received between nine to twelve weeks of nutrition education each year. The study revealed that nutrition knowledge was consistently better over all three years in the treatment group. The program's influence on attitudes and self-reported eating behaviour was less distinctive. Small changes were noted and the researchers suggested that more significant changes may occur over an extended time period. A limitation recognised by the researchers was that the attitudinal scale employed only three points on the scoring continuum and therefore, there was difficulty in detecting change. Shannon and Chen noted that if changes to attitudes and dietary behaviour were important then school-based programs need further development.

Nutrition education strategies based on knowledge, have failed however to alter behaviour (Charney and Lewis, 1987), and therefore, although knowledge is considered important, it is not enough. The association between intention to change and knowledge is consistent but not strong. Other factors, besides knowledge, influence children much more strongly, and health education campaigns should view information as a minor element in promoting change. Parahoo (1984) suggested that it is important for children to learn about the effects of diet on health, but they also need to develop skills to combat the influence of the media, and skills to help them make informed choices about food.

Environmental Factors in the School

Five broad strategies to change nutritional behaviour were proposed by Charney and Lewis (1987). These were education, changing unhealthy commodities to healthy commodities, altering prices to induce change, changing food provided in institutions, and changing regulations affecting food availability through administrative action (p. 173). The strategies are based on the concept that people may understand the need to change to a healthier diet, but are influenced by other factors in their selection of food. In Australia, the National Health and Medical Research Council (1988) produced a report on nutrition education in schools which noted that the school environment often contradicts classroom messages about healthy nutrition. For example, food served in the canteen, on camps and gala days often does not reflect the message given in nutrition lessons. As the school canteen is part of the school environment, it has a responsibility to support classroom programs and provide food that is consistent with the Dietary Guidelines For Australians (see page 6). As a result of a school canteen improvement program carried out in Eastern Sydney, New South Wales, Allen and Amanatidis (1990) concluded:

Classroom nutrition and health education programs need to be supported by the school environment. As the school canteen is an integral part of the school environment, it should reflect and support the educational aims and values of the school (p. 1).

Nutbeam et al. (1987) surveyed seventy five secondary schools in Wales to investigate the curriculum development for health education, the school environment, and family and community links. Very few of the schools had adopted a nutritional policy that extended beyond classroom activities. Policies and practices often provided hidden messages which supported or conflicted with the curriculum, and examples were cited of teachers who smoked and the poor nutritional content of school meals. It was suggested that parents should be encouraged to consider the nutritional value of packed lunches, and schools should consider what is being sold in tuckshops. "School tuckshops can offer a range of nutritious snacks to pupils and still make a profit for school funds - they should be encouraged to do so" (Nutbeam et al., 1987, p. 113).

Hochbaum (1981) and Perry et al. (1985) promoted the importance of educational efforts being supported by the school environment. There should be opportunity for purchase of healthy snacks to facilitate healthy behaviour. In addition, barriers to healthy eating should be removed or reduced. Hochbaum used the example of offering sugar-free and low-sodium snacks. In support of this, Glanz and Mullis (1988) stated:

Environmental interventions are an important part of overall efforts to improve health in populations; they remove the emphasis on personal health behaviours and move it to factors in society or culture that generate or set the stage for unhealthy practices (p.397).

Glanz and Mullis noted that usually only the "safety" of food is considered, and not necessarily the "healthfulness". They suggested that environmental strategies should include opportunities for healthy choice and should influence demand, for example, promotion, incentives and point-of-choice information. Parcel et al. (1987) agreed that children can not practise what they have learnt in the classroom if they are offered only high-fat and high-salt foods. The school environment should enable and reinforce healthy behaviour. They reported on the "Go For Health Project", a three year school health promotion project in Texas City. Interventions were based on organisational change and social learning theory to facilitate change in diet and promote exercise among elementary school children.

Social learning theory (SLT) recognises that environment influences learner behaviour by providing both discriminative stimuli and reinforcement. The theory emphasises personal cognitions in the learning process, including self-efficacy, behavioural capability, expectations, and self-control (Parcel et al., 1987, p. 154).

The work of Parcel et al. (1987) involved an existing school lunch program where schools participated in a federally sponsored lunch and breakfast. Students who qualified were eligible to receive free or reduced cost meals (60% of students attending American public schools). The project recognised the possibility of improving school lunches by menu change, purchasing practices, standard recipes and food preparation practices. An important feature of the project involved inservice training for school lunch personnel to learn about preparing meals of low fat and sodium content. It was proposed that

organisational change was a dynamic process that should involve all of those affected; parents, administration, board members, teachers, food service staff and students. The four stages of change suggested were institutional commitment, structural alteration in policies and practices, changes in roles and practices of staff, and implementation of learning activities.

Simons-Morton et al. (1988) also reported on the "Go For Health" project, after two years and three data collections. Results showed that there were substantial reductions in the consumption of sodium and fat. The report concluded that such a project targeting diet and physical activity addresses two of the major health promotion objectives of that country. The evaluation of the program supports the feasibility of changing certain environmental factors that directly affect student dietary behaviour and physical activity.

A similar study in New England, (United States of America) described a longitudinal study conducted in two boarding high schools where environmental changes were adopted but no change was made to the education component. The food service interventions involved sodium reduction and fat modification. Training was directed at food service personnel to implement changes in purchasing and preparation of food, and care was taken to ensure that the modifications were acceptable to students (Ellison et al., 1988). Results revealed statistically significant decreases in blood pressure in students with the change in diet. The authors stated that persistence with such diets would lead to profound effects on future hypertension. These effects would be further enhanced with education programs for students and parents.

Evanson and Woods (1989) noted some disturbing findings in a study on school meals in Northern Ireland. In 1980, the British government abolished the requirement on local education authorities to adhere to national minimum nutrition standards. It was considered that a major opportunity for establishing a basis for healthier eating in later life was gone. The authors noted concern that in one Belfast school 1,066 portions of chips and 80 chip butties were sold and only two salads. A twenty-four hour dietary recall was administered to 91 students and it was revealed that the fat intake was alarmingly high. They concluded that improved school meals in combination with health education, might promote healthier eating.

Policy and Practice in School Canteens

The New South Wales Department of Education (1987, p. 8) described schools as, "... centres where the skills of living and learning are developed". It described the canteen as an integral part of the school and therefore an education resource that should teach about sound nutrition practices. Others have echoed this point of view (Newell, Howes, McEwan & Newell, 1984, Australian Nutrition Foundation, 1985, Health Department of Victoria, 1988, National Health and Medical Research Council, 1988 and Allen & Amanatidis, 1990.).

The National Health and Medical Research Council (1988) stated that considerable efforts have been made to improve the nutritional value of food sold in canteens,

however, very few significant improvements have been reported. The Council suggested that conflicting aims were responsible for lack of improvement. Schools depend upon the canteen for profits and nutritious food often requires more handling and storage, and therefore is more expensive. The Council maintained that profitability had more to do with good management than the nutritional value of the food. Nutbeam et al. (1987) and Allen and Amanatidis (1990) agreed that canteens could produce healthy snacks and continue to make a profit, and Ports (1989) believed that more attention should be given to how the canteen related to the curricula of health and physical education, and home economics.

In Australia, many groups have identified the need for school canteens to conform to the Dietary Guidelines For Australians when making decisions about food choices (Australian Nutrition Foundation, 1985, Health Department of Western Australia and the Ministry of Education, Western Australia, 1987, New South Wales Department of Education, 1987, Health Department of Victoria, 1988, and Ports, 1989). Unfortunately, other factors not related to nutrition appear to be considered a high priority. Parcel et al. (1987) remarked that personnel and food are the most costly components of school lunch services. Personnel time is saved by selling vendor-prepared food; this food requires very little preparation but often contains high amounts of fat and salt. The National Health and Medical Research Council (1988) and Allen and Amanatidis (1990) reported that food companies provide incentives to canteens that sell their products. The companies loan pie-warmers and fridges to facilitate sales and provide rewards for high sales in snack foods. The less nutritious foods are better promoted, therefore canteen organisers need to consider the marketing strategies for

healthy foods. Typically, canteen personnel have little education about nutrition, finance, management and marketing.

Various studies and reports recommend food types that should be promoted for sale in school canteens. A study in the United States of America by Hinkle (1982) recommended that emphasis should be placed on complex carbohydrates including more fruit, vegetable and wholegrain products. Hinkle remarked that sugar laden products from the school vending machines competed with the school lunch program and set an example for lifelong fatty eating habits. She also noted that to stop the sale of confectionery can bring opposition from students, parents, vendors, and the school administration who believe that such sales are important sources of profit.

Newell et al. (1984) conducted a survey of 582 high school students in the outer suburbs of Sydney, New South Wales. They found that the most popular foods, in decreasing order of consumption, were icecreams, fruit juice, crisps, soft drinks, health bars, sausage rolls, meat pies, fruit, sandwiches, bread rolls and chocolate bars. They noted that the majority of these foods left much to be desired in nutritional terms. An English survey from the Bradford Health Authority (1985) investigated the types of food being sold in 218 schools of that region. Several recommendations ensued from the survey. They suggested that there should be more green foods, wholemeal foods, and low-fat unsalted crisps. There should also be less cordial, soft drinks, confectionery and chocolates, and no high-fat, high-sugar cakes.

The Health Department of Victoria (1988) echoed earlier works in recommending that canteens should make available and promote a wide range of foods that are low in fat, sugar and salt and high in fibre, encourage teachers and students to select from a variety of foods, and work with teachers to co-ordinate nutrition and health messages in accordance with the Dietary Guidelines for Australians.

Canteens in Western Australia

In 1987, the Health Department and the Ministry of Education were involved in a joint initiative to produce a document entitled "Guiding Principles - for the development of a school canteen nutrition policy". The organisations acknowledged that canteens had long been managed by parents' associations, and guidance was necessary to assist decision-making groups with the development of canteen nutrition policies. The seven guiding principles are as follows:

- 1. The school canteen is an integral part of the school environment and as such its activities should complement the school nutrition education program.**
- 2. The school canteen has a responsibility to assist students in the selection of nutritious meals and snacks.**
- 3. The selection of food items offered should be based principally on their nutritional value.**

This selection should be in keeping with the Dietary Guidelines for Australians, which include:

- * Choose a nutritious diet from a variety of foods.**

- * Control your weight.
 - * Avoid eating too much fat.
 - * Avoid eating too much sugar.
 - * Eat more breads and cereals and vegetables and fruit.
 - * Use less salt.
4. School canteens should maintain good business practices and be commercially viable, so that they do not constitute a drain on the school's resources.
 5. School canteen committees and management staff should consult relevant support personnel regarding appropriate food selections.
 6. Where an ethnic minority forms a sizeable proportion of the school population, consideration should be given to including appropriate foods on the canteen menu.
 7. Salaried canteen management staff should be strongly encouraged to undertake training appropriate to their position (1987, p 6).

A group called *Nutrition Link* conducted a survey of all schools in Western Australia, which included both primary and secondary, government and non-government schools in June 1988. This group comprised representatives from government and non-government agencies, and industry. It aimed to develop a database of basic demographic data about schools and information specific to canteens. Results indicated that 60% of principals recalled receiving the Guiding Principles document, (from the Health Department and the Ministry of Education of Western Australia), and about 50% read it. Similar percentages were established by canteen managers for the use of the

document. The survey revealed that 70% of schools were already following the guidelines, but only 12% commented that they had already written a school canteen policy. It was revealed that the majority of respondents indicated the major role of the school canteen was to provide nutritious food and drink, and the second role was to reinforce classroom nutrition education. Despite this, the data showed that most schools sold larger quantities of high fat foods such as sausage rolls, pies, hamburgers and pizza subs. Approximately a third of the respondents indicated that cakes and confectionery were sold although few schools sold chocolates and confectionery. Only 8% sold cool drinks whereas 92% sold flavoured reduced-fat milks. The survey was unable to provide a comprehensive database for school canteens in this State because of the low return rate of questionnaires (35%). However, it would appear that there is a range of practices occurring in canteens with varying value being placed on nutrition.

Summary

Several key issues have become apparent from a review of the literature. Cardiovascular disease was identified as a leading cause of death in Australia and other western countries, and is a great cost to the community. Premature death from cardiovascular disease is largely preventable, and one of the most important preventative measures is healthy eating.

Dietary habits are learned during childhood, and to teach children good eating habits is preferable to changing adult behaviours. In addition, precursors to preventable lifestyle diseases such as heart disease are often evident during childhood, therefore, educational efforts at this time may well alter the future health of children. Children adopt dietary behaviours as a result of a number of influences, including school nutrition education and the school canteen. The school canteen can be of particular importance because it strengthens and complements classroom instruction, and can contribute to a significant proportion of a child's daily food intake. Previous studies suggest that a healthful environment should support classroom instruction for the best results, that is, canteens should sell healthy food that reflects nutrition education programs.

School canteens have traditionally been managed with profit as a high priority and often with little consideration given to the educational influence of the food service. In many instances, the sale of healthy food has not been considered as financially profitable. As a result, many canteens in Australia and elsewhere have sold food that is not of a nutritious nature.

CHAPTER 3

METHODOLOGY

The methodology utilised for this study was developed with consideration to the many factors that influence children's dietary behaviour. The conceptual framework places these influences in perspective and identifies the canteen as an important factor in availability and accessibility of food. The research design is based upon the need to control other influences on dietary behaviour so that the effect of canteen menu can be measured. This chapter also explains the procedures used in the development of the measuring instruments. The issues of reliability and validity have been considered and explained. In addition, the selection of study schools is detailed. These procedures are considered critical to the research design.

Conceptual Framework

The conceptual model for this study was derived from Green's PRECEDE model (Green, Kreuter, Deeds & Partridge, 1980), which explains health behaviour in terms of Behavioural and Non-behavioural causes. The Behavioural causes have been divided into three categories: Predisposing Factors, Enabling Factors and Reinforcing Factors. The Non-behavioural causes identified are those over which the individual has little or no control. The PRECEDE model acknowledges that many factors affect health behaviour. This concurs with the concept developed in the literature review that many factors influence dietary behaviour. The PRECEDE model was chosen because the identified dietary influences fit readily and logically into the model.

The model illustrates the relationship between various components and their influence on dietary behaviour, and shows that dietary behaviour is influenced by several Behavioural causes. Predisposing factors, such as an individual's knowledge, attitudes and perceptions, incline an individual to certain types of dietary behaviour. Reinforcing factors including the attitude and behaviour of parents, siblings, teachers and peers, and the media, influence children significantly. Enabling factors include availability and accessibility of food types. Non-behavioural causes include age, sex, socio-economic status and ethnicity. The model indicates that Predisposing and Reinforcing factors are related, for example, an individual's attitudes towards diet may be influenced by his/her parents, or influence the attitudes of his/her parents. The model shows how dietary behaviours determine diet related problems, and in turn the quality and length of life. Dietary behaviours learned in childhood become the habits of the adult and considerably affect the health of the individual in both the present and the future.

This study focussed on the Enabling factors and specifically the availability and accessibility of food types in the school canteen. Other causes, whether Behavioural or Non-behavioural have been controlled in so far as they could be identified.

FACTORS EFFECTING DIETARY BEHAVIOUR

BEHAVIOURAL CAUSES

Predisposing Factors
eg: individual's knowledge,
attitude and perceptions



Reinforcing Factors
eg: attitudes and behaviour of
parents, teachers, peers and
media

Enabling Factors
Availability and accessibility
of food types, price

NON-BEHAVIOURAL CAUSES
eg: age, socio-economic status,
ethnicity, sex

DIETARY BEHAVIOUR
eg: eating at school, at home and
habits formed for life

**Health Status
related to diet**

Quality and length of life

Adapted from Green et al., (1980)

Research Design

The research design for this study was based on a quasi-experimental model. In retrospect this model did not prove to be entirely adequate. Schools that were expected to change canteen menus did not change and therefore, one of the research questions could not be properly addressed. The study focussed on three groups of students, selected on the basis of the school canteen menu. Goetz and LeCompte (1984) outlined the use of criterion-based selection as necessary when only a few subsets of the population exhibit characteristics relevant to the research. In this case, the nature of the school canteen determined the sample of students selected for study. Three types of canteens were sought;

Canteens that offered predominately healthy food choices. (Group HE)

Canteens that did not offer predominately healthy food choices but changed to a healthier menu during the study period. (Group CH)

Canteens that did not offer predominately healthy food choices. (Group CO)

A questionnaire and diet recall of food eaten at school were administered to each group in a pretest and post-test with five months between the phases. After the pretest, results were analysed to explore the differences between groups of students from schools with predominately healthy canteens and those from schools without predominately healthy canteens. After the post-test, comparisons were made between groups to determine any change that may have occurred within groups as a result of canteen menu change.

The independent variable for this study was the canteen menu of the schools. The classification of schools by canteen menu is described in detail in the section **Selection of subjects**. The dependent variables were the knowledge, attitudes and behaviour of the students. Student knowledge about nutrition and attitudes towards nutrition were measured in the two-part questionnaire. The diet recall were conducted by small group interviews.

The following are possible extraneous variables that could affect results. They will be discussed as appropriate in later sections.

- * Classroom instruction.
- * Socio-economic status.
- * Advertising and promotion of food in the media.
- * Accessibility and cost of food types outside of school.
- * Ethnicity and family influence.
- * Age and sex of study sample.
- * The attention focussed on the canteen and nutrition when changes to the menu are implemented.

Instrumentation

A two-part questionnaire was developed to test student knowledge and attitudes. It was based upon the Dietary Guidelines for Australians, established by the Commonwealth Department of Health (1988), (see p.6 of this document). The Dietary Guidelines for

Australians addresses problem areas in the typical Australian diet. The guidelines suggest reductions in consumption of fat, sugar and salt, and encourage an increased consumption of fibre. These four nutrients have been specifically addressed as dietary concerns and provide a basis on which the instruments for this study were developed. The instrument that records dietary behaviour is a standard format required by the Systems On-line Dietary Analysis package (S.O.D.A.).

Part 1: Attitudes

This section consisted of seventeen items employing a five point Likert scale of strongly agree, agree, unsure, disagree and strongly disagree. It was decided to include a neutral category so that a shift in attitude from unsure to positive or negative, could be assessed. Each item was a statement about nutrition expressed either positively or negatively. The items were developed to assess attitudes towards nutrition, and were based on the Dietary Guidelines for Australians.

Part 2: Knowledge

This section consisted of twenty multiple choice questions. Each question was designed to test knowledge derived from the Dietary Guidelines for Australians. Students were assigned a mark out of twenty for nutritional knowledge and average class scores were calculated.

Part 3: Diet Recall

This section required the respondents to supply information about the food they ate at school that day. Students were required to list the type and amount of food consumed. The administration procedure for this section was the most critical and is fully explained in a later section.

Three major ways for the recording of dietary behaviour were examined. Food diaries were employed by Ellison et al. (1988) on an assigned weekday or weekend day each week for six weeks. This method was considered inappropriate for this study for the following reasons:

- * Diary return is difficult to ensure.
- * Detail about the type and amount of food may be neglected without trained personnel present to probe for detailed responses.
- * It is time consuming and expensive.
- * Six diary recordings (both at the pretest and post-test phase) may be obtrusive and affect outcomes of the study.

Another method involving the listing of foods "usually" eaten during a given period was employed by Shannon and Chen (1988). This method however could encourage invalid responses as the students might be more likely to list foods that they thought were "good" foods rather than a true record of their eating behaviour. For the same reason, it was decided to avoid using a closed-response list of foods that required respondents to tick foods that they had eaten. Pearson and Carlgren (1984) cited in Perry et al.,

1985, p.400 concluded:

.... intra-individual variation is far too great to be represented only by 24 hours' food intake. Group mean estimations, however, obtained through recalls and seven-day records respectively, are close to each other. The 24-hour recall method may therefore be used as a quicker and cheaper way of making group mean estimates of food intake in children.

A modified version of the twenty-four hour recall method was selected. Children were interviewed in the afternoon of a normal school day and were asked to recall the food they had eaten at school that day. Consequently, the children were required only to remember what they had eaten for the last four or five hours.

Each record of dietary behaviour was analysed by the S.O.D.A. package. Detail about nutrient value, including fat, salt (sodium), sugar and fibre content were itemised. The accuracy of the analysis was enhanced by consulting with canteen managers at each school. Information was sought about the ingredients used in recipes for canteen prepared food.

Pilot Testing

The questionnaire and diet recall were pilot tested in three phases. The three phases were conducted to enhance the reliability and validity of the instruments. The first phase

explored face and consensual validity. This phase entailed consultation with dietitians from the National Heart Foundation (WA Division) and the Health Department of W.A., Research Consultants from Edith Cowan University, and the Education Director of the National Heart Foundation (WA Division). These individuals read the instrument and considered the accuracy of the content and suitability for the study group. In addition, they considered how well the instrument addressed the Dietary Guidelines for Australians. Each individual supplied feedback to improve accuracy of expression and of the material, thus improving content validity.

A focus group of six children was used for the knowledge and attitudinal section of the questionnaire. After the group completed the questionnaires, each item was discussed to explore comprehension. Students were asked why they chose their response, regardless of whether their response was right or wrong. From this questioning, it was ascertained whether the student understood the question, therefore improving construct validity. Some minor adjustments to wording of the items ensued from this phase.

The third part of the pilot testing entailed administration of the instrument to a full class of students. Students were divided into small groups to be interviewed for diet recall, and then returned to the normal class group for the remainder of the questionnaire. This trial enabled adjustments to improve the classroom procedures, to test the processing and analysis of the completed instruments. The questionnaire was administered to the same group two weeks later so that a score for test-retest reliability could be calculated for the knowledge and attitudinal section. Students received a score out of twenty for both administrations of the knowledge section. A Pearson r value for test-retest

reliability was calculated to be 0.56 ($p < 0.003$). This was considered acceptable. The attitude section was subjected to an item analysis; a Pearson r value was calculated for each item. An item analysis was considered necessary for the attitude section because although the reliability of the knowledge section was relatively easy to ensure, it was felt that the attitudinal items required greater scrutiny. Three items scored poorly and were rejected as being unreliable. The remaining items achieved scores between 0.40 and 0.83 ($p < 0.05$), and were deemed acceptable.

Selection of Study Population

The selection of the study group was carefully considered so as to control possible extraneous variables. Year Five students in six schools were investigated. All schools were metropolitan and government, and there were approximately the same numbers of boys and girls in each group. There were 177 students involved in the pretest phase of the study. Table 1 shows the number in each of the three groups and their gender.

Table 1. Pretest sample population by group and by gender

	Boys	Girls	Total
Group HE	31	26	57
Group CH	28	31	59
Group CO	27	34	61
Total	86	91	177

Year Five was selected as the focus group as it is the only year when nutrition is not addressed in the syllabus. The Health Education K-10 Syllabus outlines a number of objectives for each year group, but as none of the objectives are nutrition-related in Year Five, the variable of classroom instruction and curriculum influence were controlled as far as possible.

Selection of schools for this study was criterion-based. A number of canteen menus were collected from metropolitan primary schools of lower to middle socio-economic status. At the same time, canteens were sought from school communities that expressed an intention to make healthy changes to the canteen menu. (Note; for the purposes of this study, healthy food was deemed to be food that is low in fat, salt and sugar or high in fibre). These schools were identified by officers working with school canteens. The officers included personnel from the Western Australian Council of State School Organisations, National Heart Foundation (W.A. Division) and the lecturer from the Canteen Management Course (Bentley and Carine Colleges of Technical and Further Education).

It was decided to utilize three independent individuals besides the researcher to assess the menus and thus employ *investigator triangulation*. (Cohen and Manion, 1980, p.213). It was described as

....the use of more than one observer (or participant) in a research setting. The careful use of two or more observers or participants independently can lead to more valid and reliable data.

A panel was formed consisting of two dietitians, the lecturer from the Canteen Management Course and the researcher. Each member of the panel independently rated the menus (0-10). The panel then discussed the menus and selected possible schools for each category. Six schools were selected with two for each group. Contact was made with the principals and Year Five teachers to obtain permission to conduct the research. All six principals expressed an interest in being involved.

Two schools were chosen for each category as follows:

Group HE. Canteens that offered predominately healthy food choices.

Group CH. Canteens that did not offer predominately healthy food choices but changed to a healthier menu during the study period.

Group CO. Canteens that did not offer predominately healthy food choices.

The following explains how each group came to be selected, including panel ratings and comments.

Group HE: (Both menus scored 8 or 9 from panel members)

Comments

* Hot food was canteen prepared with attention to taste and nutrition.

- * Small number of items on the menu.
- * Cake selections were fruit based and/or canteen prepared with low-fat, low-sugar recipes
- * No pastry items or other high fat foods were sold.
- * Sandwiches and rolls were made with wholegrain breads and most were served with salad.
- * Drinks included fruit juices and flavoured, reduced-fat milk.
- * Fresh fruit was available.
- * Where ice confectionery was available, these were sold only after the initial lunch sales and only one per child.

Groups CH and CO: (All menus scored 3, 4 or 5 from the panel)

Comments

- * Hot food included many commercially produced snack foods considered to be too high in fat and sodium and of poor nutrient value.
- * Sandwiches and rolls were made with white bread. Salad was not automatically included.
- * Little or no fresh fruit was available.
- * Soft drinks were available in some cases.
- * Cake selection included many commercially produced varieties with high sugar content and little nutrient value.

Note. Group CH schools previously indicated a desire to make healthy changes to the menu.

Menus from the six canteens were collected again before the post-test data collection to compare changes that occurred during the study period. All menus are contained in Appendix E.

During the process of selecting study schools, socio-economic status was considered. The Australian Bureau of Statistics (1988) supplies an indicator of socio-economic status which enables classification of status by postcode. The data were based on 1986 census information. Indices range between zero and 150, with a mean of 50 and a standard deviation of 10.

Each respondent in this study recorded the suburb in which he/she lived so that socio-economic status could be compared. Respondents' indices ranged between 92.16 and 100.01 with a mean of 96.29, which indicated that the socio-economic status of the study population was similar. The selection of schools from similar socio-economic neighbourhoods helped standardise family influences on eating behaviour. Care was taken not to select sample schools from neighbourhoods with significant populations of ethnic cultures.

Restricting the study schools to those within the metropolitan area allowed control over other variables. Access to different food types would have been similar for all students; take-away food outlets and supermarkets are evenly dispersed throughout Perth. In addition, it could be reasonably assumed that children living in the metropolitan area were subject to the same media, advertising and other promotions. Access to various radio and television channels, newspapers and magazines is also similar throughout

Perth.

Changes to a canteen menu at a given school may have created a Hawthorne effect in the school community. Gay (1987) described the Hawthorne effect as "A type of reactive arrangement resulting from the knowledge that they are involved in an experiment, or their feeling that they are in some way receiving "special" attention" (p.545). Students may have reacted to the change in the canteen menu and research investigations in a way that distorted their responses. In addition, other members of the school community may have responded to the change in canteen menu in a way that influenced the children. For example, the canteen staff may have developed special promotions for the new food items or parents and teaching staff may have displayed an unusual interest in the canteen that the children noticed. Two control considerations were made for these extraneous variables. The inclusion of group HE schools (those with a canteen menu that was predominately healthy, and had maintained a stable menu over an extensive period of time), provided a control with which group CH schools were compared. To further control a possible Hawthorne effect, students were not warned of the proposed research, or that the research had any relationship to the change in canteen menu.

Data Collection

Students completed a diet recall before the other sections of the questionnaire. By administering this section first, it was expected that a more valid record would be obtained, as responses were unlikely to be tainted by statements and questions given in

the questionnaire. The section assessing attitude preceded the knowledge component for the same reason.

Diet Recall

Students were separated into small groups. They were then asked to record all food they had eaten at school that day. Research assistants used prompts to help each student record as much detail about the type and amount of food as possible. Descriptions of the type of food for example, would discern between full-cream milk, Hilo milk and skim milk. Metric cup measures and spoons assisted students in giving accurate measures. To help students remember the food they had eaten, the record sheet was divided into meal times; before school, morning recess and lunch. They were reminded to include any drinks they had consumed. A briefing for the research assistants is included in Appendix B.

Questionnaire

Students were presented with the questionnaire and were given a brief explanation about the study. It was made clear that it was not a test, and they did not have to write their names on the paper, but that honest responses were important. Students were encouraged to ask questions if the items were not clear to them. The researcher read through the cover sheet aloud and completed the examples with the group. The students were then instructed to finish the questionnaire. Students remained in normal class groups for the administration of the questionnaire.

Data were collected in two phases. The initial phase occurred during the first two weeks of term three in July, 1990, in the afternoon of a normal school day. The same collection procedures occurred during the second phase, which was during the last two weeks of the school year, in December 1990. A set of descriptive statistics were developed for each class group for comparison.

Data Processing and Analysis

The three parts of the data collection were processed in different ways. The dietary analysis package S.O.D.A. was used to process the diet recall. S.O.D.A. analysis measures the amounts of each nutrient, and the percentage of the total energy which originates from fat, carbohydrate and protein. Particular reference was made to fat, sugar, sodium and fibre contents. These data were compared with Recommended Dietary Goals (RDGs) which have been defined for the purposes of this study. RDGs were collected from a variety of sources where suggested guidelines for diet intake have been stated. Although the Commonwealth Department of Health suggested goals for sodium, fat and fibre, the more recent goals suggested for fat and sodium stated by other sources were selected for this study. The RDG for sodium was derived from the Recommended Dietary Intakes (RDI) as specified by the National Health and Medical Research Council (Truswell, 1989). RDIs are the average levels of nutrient intakes which will meet the nutritional needs of the majority of the population. The RDG for fat is that suggested by the National Heart Foundation (1989). The RDG for fibre is the amount suggested by the Commonwealth Department of Health (1987). There was no recommendation for the amount of sugar to be consumed daily.

Group sets of dietary data and knowledge scores were compared by ANOVA tests. The Epi Info (V) package administers a Bartlett's test for homogeneity of variance and an ANOVA simultaneously. If the Bartlett's test shows significant divergence of variance, a non-parametric test is used rather than ANOVA. Epi Info (V) employs a Kruskal-Wallis one-way test of variance for non-parametric data.

An Epi Info (V) package was used to process the attitudinal section of the questionnaire. Class percentages were derived for each of the seventeen items showing responses to strongly agree, agree, unsure, disagree and strongly disagree. Chi-square tests were applied to ascertain the statistical differences between the results of each group.

Differences between groups were explored at three stages. An ANOVA was applied after the pretest phase and the post-test phase. T-tests were used to compare change within each group between pre and post-test phases.

The use of Analysis of Covariance tests (ANCOVA) was considered for data analysis. Gay (1987) explained that "ANCOVA adjusts post-test scores for initial differences on some variable and compares adjusted scores. In other words, the groups are equalised with respect to the control variable and then compared" (p.394). This study involved the deliberate selection of groups that were different. ANCOVA manipulates post-test scores to equalise groups, therefore, it was not considered appropriate for this study design.

Assumptions

A number of assumptions were made with regard to the study population and the research procedure.

1. That the subjects had all completed Health Education K-10 Syllabus objectives outlined for pre-primary and Years One to Four (see Appendix C).
2. That teachers did not include any extra nutritional instruction during Year Five.
3. That all students had at least minimal contact with the canteen, or if not regular users, they had contact with students who were, and therefore were aware of the types of food that it offered.
4. That students in the study groups had similar access to a variety of food types from outlets in their neighbourhood and that the prices of different types of food were similar also.
5. That all students had similar access to television and radio stations, newspapers and magazines and that similar advertising and promotion of different food types were received by all subjects.
6. That all students were of a similar age (10 years old) and there was an approximately equal number of boys and girls.

7. That the food that children ate at school was approximately one third of their total daily intake.

Limitations

A number of factors may have negatively affected the results of this study. The research recognised the following limitations.

1. Changes in attitudes often occur over a long period of time. The five month time lapse between pretest and post-test may have been too short a time to affect changes in attitude.
2. It is difficult to measure family influences on dietary behaviour. Family influences may constitute an extraneous variable that cannot be controlled or measured.
3. The researcher was unable to control any special promotions implemented by the canteen staff or food retailers for a particular canteen.
4. Students may not have received the same background information in nutrition education.
5. Although the S.O.D.A. package was the best available means of dietary analysis

at the time of this study. It was unable to give accurate nutritional information about all food.

6. The S.O.D.A. package did not differentiate between sugars from differing sources. For example, sugars from fruit were identified as the same as sugar from confectionery.
7. The Pearson r value of 0.56 for the test-retest reliability was considered acceptable but at the lower level of acceptability. In retrospect the knowledge scale would have been better tested in isolation, not together with the attitude scale and the diet recall. The fact that they were tested together may have caused the Pearson r to be lower than expected due to the effects of information gained from the latter testing. Knowledge scores may have improved after completing the three tests.

Summary

The aim of this study was to measure the influence of a school canteen menu on student knowledge, attitudes and behaviour. The literature suggested that a healthful school environment should support classroom instruction, and specifically, that the school canteen should sell healthy foods that reflect the content of nutrition lessons. Although the school canteen is one of many factors that affect dietary behaviour, it was considered to be one of educational and health promotional importance. Canteens are

part of the educational community, and they reach most students who could be considered to be a captive audience.

Because so many factors affect dietary behaviour, research into the area is a difficult task. The questionnaire and dietary analysis attempted to gauge the three aspects of health education; knowledge, attitude and behaviour. Conducting the pretest and post-test phases enabled measurement of change that may have resulted from canteen change. Chi-square and ANOVA tests provided comparison between study groups and revealed statistically significant changes. The selection of the study sample was perhaps the most demanding aspect of this study, as careful selection was required in order to control many of the variables that could influence results.

CHAPTER 4

ANALYSIS OF RESULTS

This chapter is divided into three sections: an analysis of the results of the pretest, an analysis of the results of the post-test and differences between the pretest and post-test results. Analysis of the pretest results explores the differences between groups before any change occurred in canteen menus. Analysis of the post-test results explores differences between groups after a change of menu occurred for canteens in group CH. Differences between the pretest and post-test results are examined in order to ascertain changes that occurred in each group during the period of the study.

ANOVA tests were used to compare knowledge and dietary results in the pretest and post-test. T-tests were applied to compare changes between the two sets of data for each group. When a Bartlett's Test for Homogeneity of Variance showed that the data was non-parametric, a Kruskal-Wallis One Way Test of Variance was used in place of ANOVA or T-tests. Items in the attitudinal section were analysed employing Chi square tests.

Analysis of the Pretest Results

Use of the canteen

Students were asked if they had used the canteen on the day of the data collection. Of

the total study population, 41.03% had bought an item from the canteen and 58.97% had not. There was some difference between groups although the difference was not of statistical significance. More students from group HE used the canteen on that day compared to groups CH and CO which showed similar results. Table 2 outlines the results in detail.

Table 2. Use of the canteen on the day of the pretest

	Yes (%)	No (%)
Group HE	48.2	51.8
Group CH	35.6	64.4
Group CO	39.3	60.7

Students were asked how often they usually used the canteen during the week. There was no significant difference between groups. Overall, it was found that more than half of the students (58.9%) used the canteen once or twice during the week. Group CO differed from groups HE and CH in that more students did not use the canteen, although more group CO students used the canteen three or more times.

Table 3. Normal weekly canteen use (Pretest)

	0 days (%)	1or2 days (%)	3 > days (%)
Group HE	14.8	62.9	22.3
Group CH	13.6	67.7	18.7
Group CO	23.0	45.8	31.2

Knowledge about nutrition

No statistical significance was determined between groups. Means and standard deviations were similar. The means for groups HE, CH and CO were 11.07, 12.16 and 11.01 respectively. The standard deviations were 3.79, 3.57 and 3.19.

Dietary behaviour

Four items of the dietary analysis were selected for comparison. Data about fibre, sodium and sugar intake were recorded as was the percentage of energy that was derived from fat. Table 4 shows the average amount of the selected nutrient for each group. The Recommended Daily Goal (RDG) for fat, sodium and fibre is listed. For the purposes of this study, a third of the total RDG is presented because the "at school" diet is assumed to be approximately a third of the total daily diet.

The mean percentage of energy from fat was significantly lower for group HE than it was for groups CH and CO ($p < 0.05$). The mean percentage of fat for group HE was lower than the RDG whereas those for groups CH and CO were slightly higher. The mean for fibre consumption proved to be significantly higher in group HE than both groups CH and CO ($p < 0.005$). In addition, the mean fibre intake for group HE was close to the RDG whereas the means for groups CH and CO fell well below. There was no significant difference between groups in the consumption of sodium or sugar.

Table 4. Selected nutrients for "at school" diet by group means (Pretest)

	Fat (%)	Sodium(mg)	Fibre(g)	Sugar(g)
Group HE	26.57 ¹	725.71	10.16 ²	36.79
Group CH	31.08 ¹	776.77	4.85 ²	30.93
Group CO	32.75 ¹	784.9	5.39 ²	28.52
RDG	30	30-800	7-10	-

¹ ANOVA=4.29, df=2, $p < 0.05$

² Kruskal-Wallis H=10.76, df=2, $p < 0.005$

Table 5 shows the percentages of fat from the total energy intake for the sub-groups of canteen users and non-canteen users in each group. Statistical tests revealed two significant differences. Canteen users in group HE consumed significantly less fat than

canteen users in both groups CH and CO ($p < 0.001$), and canteen users in group CO consumed more fat than non-canteen users of the same group ($p < 0.01$). There was a similar trend for group CH but an opposite trend for group HE. Of note is that non-canteen users from each group generally consumed less fat than the RDG. The canteen users in group HE consumed less fat than the RDG but canteen users from both groups CH and CO consumed more.

Table 5. Mean percentage of total energy from fat for canteen users and non-canteen users (Pretest)

	Canteen users (%)	Non users (%)
Group HE	24.67 ¹	28.14
Group CH	34.34 ¹	29.14
Group CO	38.02 ^{1 2}	29.22 ²

¹ Kruskal-Wallis $H=25.98$, $df=2$, $p < 0.001$

² ANOVA= 8.21 , $df=1$, $p < 0.001$

With respect to fibre intake, (Table 6) there appeared to be a trend towards canteen users of group HE to be consuming more. Among non-canteen users, members of group HE consumed significantly more fibre than those of groups CH and CO ($p < 0.05$). The mean fibre intake for both sub-groups in group HE (10.215g) exceeded the RDG

(7-10g). The mean fibre intake of canteen users and non-canteen users for both groups CH and CO were below the RDG for fibre.

Table 6. Mean fibre intake for canteen users and non-canteen users (Pretest)

	Canteen users (g)	Non users (g)
Group HE	8.63	11.8*
Group CH	5.39	4.57*
Group CO	5.28	5.46*

* Kruskal-Wallis H=7.11, df=2, p<0.05

All participants consumed a reasonably high level of sodium. Among canteen users, group HE consumed significantly less sodium than groups CH and CO (p<0.05 and p<0.001 respectively). It was noteworthy that the mean amount of sodium for canteen users in group HE and all non-canteen users fell below the RDG. The mean amounts for canteen users in groups CH and CO were above the RDG.

Table 7. Mean sodium intake for canteen users and non-canteen users (Pretest)

	Canteen users (mg)	Non users (mg)
Group HE	687.9 ¹	705.97
Group CH	1056.57 ^{1 2}	618.02 ²
Group CO	1211.74 ^{1 3}	508.03 ³

¹ ANOVA=5.95, df=2, p<0.005

² Kruskal-Wallis H=6.49, df=1, p<0.05

³ Kruskal-Wallis H=25.49, df=1, p<0.001

There was no significant difference in the amount of sugar eaten either between or within groups. There was a trend towards all canteen users consuming more sugar than their peers who did not use the canteen.

Table 8. Mean sugar intake of canteen users and non-canteen users (Pretest)

	Canteen users (g)	Non users (g)
Group HE	43.78	30.1
Group CH	37.43	27.24
Group CO	31.04	26.89

Attitudes towards nutrition

A summary of results highlighting similarities and differences between groups is presented in this section. The responses in detail for each of the seventeen attitudinal items are displayed in Appendix D.

Table 9. Summary of attitude section (Pretest)

ITEMS	COMMENTS
1. I like to eat healthy food	No differences. In all groups, most students strongly agreed or agreed.
2. Most kids who are overweight can't help it	No differences. A spread of opinion in all groups with a bias towards agreement.
3. I enjoy eating fresh fruit and vegetables	No differences. Most students in each group strongly agreed or agreed.
4. School canteens should sell healthy foods	No differences. Most students in all groups strongly agreed or agreed.

5. I enjoy eating lollies and take-away foods	Significance difference ($p < 0.01$). Predominance of responses in groups CH and CO strongly agreed or agreed compared with group HE where there were more who were unsure, disagreed or strongly disagreed.
6. I like cool drinks better than fruit juice	No differences. An even spread of responses in all groups.
7. My eating habits are healthy	No differences. All groups tended towards agreement.
8. Food in our canteen is healthy	Significant difference ($p < 0.05$). Group HE were more likely to agree compared with group CO who were more likely to disagree.
9. Normal milk is healthier than low-fat milk	Significant difference ($p < 0.05$). More group HE students disagreed compared with group CO where more were unsure.
10. We should learn about healthy eating at school	No differences. Most students in all groups tended to strongly agree or agree.
11. I don't like eating fatty foods	No differences. A trend towards agreement in all groups.

12. If I have a choice, I choose healthy foods	No differences. Most students in all groups tended towards agreement.
13. I like to buy food from the canteen	No differences. Most students in all groups tended towards agreement.
14. Most people who are overweight are as healthy as people who are not overweight.	Students in all groups tended to be unsure, to disagree or to strongly disagree.
15. I like to buy healthy food from the canteen	Significant difference ($p < 0.05$). Overall, most students strongly agreed or agreed but more in group HE disagreed compared with group CH where more were unsure.
16. I like to sprinkle salt on my food	No significant difference between groups. More group HE students disagreed or strongly disagreed compared with other groups.
17. Take-away food can be just as healthy as other food	Significant difference ($p < 0.05$). More students in group HE strongly disagreed compared with group CO where more disagreed.

Findings

In conclusion, attention is drawn to several of the pretest results that revealed important similarities and differences. The use of the school canteen was similar for all groups. More students from group HE patronised the canteen on the day of the data collection, but generally usage patterns were similar. There was little difference in knowledge scores between groups; means and standard deviations were similar.

Several differences in dietary behaviour were revealed. Amounts of fat, fibre, sodium and sugar were compared between groups and between canteen users and non-users within groups, and also between canteen users in different groups. Children in group HE generally consumed less fat than those in other groups, whether or not they were canteen users. Of those who bought food from the canteen, group HE students consumed less fat than those in the other groups. Children in groups CH and CO stood a good chance of eating more fat if they bought items from the canteen.

The students in group HE overall, received more fibre than those in groups CH and CO. In addition, group HE students were likely to consume more fibre if they patronised the canteen compared with children in that group who did not. Conversely, children in groups CH and CO who bought food from the canteen generally ate less fibre than their peers who brought food from home.

Group HE canteen users were advantaged also because they consumed less sodium than others in that group and also other canteen users in different groups. There was little

difference in sugar levels consumed between any sub-groups, within or between groups.

Five differences emerged from the attitude section of the questionnaire. Group HE students were more likely to disagree with the statement "I enjoy eating lollies and take-away foods". Conversely, students in groups CH and CO were likely to agree. Of importance also was that group HE students tended to agree with the statement "Food in our school canteen is healthy", compared with group CO students who tended to disagree. Although not of statistical significance, group CH students also tended to disagree.

There were significant differences between groups in response to the statement "Normal milk is healthier than non-fat milk". Group HE students tended to disagree while more group CO students were unsure. There was a trend for group CH students to agree or to be unsure. Surprisingly, group HE students tended to disagree with "I like to buy healthy food from the canteen". Group CH students were more likely to be unsure. There was a difference between group HE and group CO in response to "Take-away food can be just as healthy as other food". While group CO students agreed, group HE students tended to disagree.

Analysis of Post-test Results

Use of the canteen

Of the total study population, 52.7% had patronised the canteen on the day of the post-test data collection and 47.3% had not. Although not of statistical significance, there were differences between groups. Table 10 shows that more students from group HE had purchased something from the canteen than other groups, and more students from group CH used the canteen compared with group CO.

Table 10. Use of the canteen on the day of the post-test

	Yes (%)	No (%)
Group HE	57.1	42.9
Group CH	53.7	46.3
Group CO	47.3	52.7

Patterns of weekly use of the canteen were similar for all groups. Overall, more than half (62.3%) bought items from the school canteen on one or two days a week. Slightly more group CO students did not use the canteen at all.

Table 11. Normal weekly canteen use (Post-test)

	0 days (%)	1or2 days (%)	3 > days (%)
Group HE	13.5	63.5	23.0
Group CH	13.5	63.5	23.0
Group CO	16.4	60.0	23.6

Knowledge about nutrition

The results of the knowledge section were not significantly different. Of a possible 20 marks, the means for groups HE, CH and CO were 12.13, 12.48 and 11.66 respectively. The standard deviations were similar at 3.56, 3.38 and 3.28 respectively.

Dietary behaviour

The post-test data pertaining to fibre, sodium, sugar and the percentage of energy derived from fat have been highlighted. Table 12 shows the average amount of each selected nutrient for each group. The RDG is also shown for comparison. There is no RDG for sugar. The mean percentage of energy obtained from fat was significantly lower for group HE than it was for groups CH and CO ($p<0.001$). The mean for group HE scores was lower than the RDG while the means for groups CH and CO were higher. The mean fibre intakes for each group were all below the RDG of 7-10g. Group

HE students however, consumed significantly more fibre than those in groups CH and CO ($p < 0.001$).

A significant difference ($p < 0.05$) was also found between group HE and the other two groups for sodium consumption. The group HE mean was significantly lower. Both groups HE and CH displayed means that fell within the RDG range and group CO was slightly above it. Examination of sugar consumption showed that the mean for group HE was significantly lower than that of group CO ($p < 0.05$). The group CH mean fell between the two.

Table 12. Selected nutrients for "at school" diet by group means (Post-test)

	Fat (%)	Sodium(mg)	Fibre(g)	Sugar(g)
Group HE	23.62 ¹	593.12 ²	6.31 ³	21.29 ⁴
Group CH	32.57 ¹	790.79 ²	5.35 ³	27.98
Group CO	32.12 ¹	808.00 ²	4.11 ³	32.5 ⁴
RDG	30	30-800	7-10	-

¹ Kruskal-Wallis $H=17.03$, $df=2$, $p < 0.001$

² Kruskal-Wallis $H=6.03$, $df=2$, $p < 0.05$

³ Kruskal-Wallis $H=28.77$, $df=2$, $p < 0.001$

⁴ Kruskal-Wallis $H=3.87$, $df=1$, $p < 0.05$

Table 13 compares the percentage of energy from fat between canteen users and non-users for each group. There was no significant difference within each group although in each case, the mean for canteen users was higher than their peers who did not use the canteen. Canteen users in group HE however, appeared to consume less fat than those in groups CH and CO ($p < 0.005$). There was a similar trend among those who did not use the canteen although statistical significance was not established.

Table 13. Mean percentage of total energy from fat for canteen users and non-canteen users (Post-test)

	Canteen users (%)	Non users (%)
Group HE	24.57*	22.9
Group CH	34.5*	30.78
Group CO	38.89*	29.07

* Kruskal-Wallis $H=12.19$, $df=2$, $p < 0.005$

The consumption of fibre appeared to differ little within groups. The mean fibre intake for canteen users and non-users is shown in Table 14. Of canteen users, the mean for group HE was significantly higher than the mean for group CO ($p < 0.001$). The group CH mean approached that of group HE. Among non-users the mean for group HE was significantly higher than the group CH and CO means ($p < 0.01$). Note that none of the group means fell within the RDG for fibre, all were lower than the recommended level.

Table 14. Mean fibre intake for canteen users and non-canteen users (Post-test)

	Canteen users (g)	Non users (g)
Group HE	6.91 ¹	5.8 ²
Group CH	6.23	4.53 ²
Group CO	4.46 ¹	3.72 ²

¹ Kruskal-Wallis H=15.63, df=1, p<0.001

² Kruskal-Wallis H=13.69, df=2, p<0.005

The mean sodium intake for each group was similar for canteen users although there was a trend for group HE students to consume less. The means for non-users were similar for all groups. Sodium intake within each group proved to be significantly different. Non-canteen users consumed less than their peers in each group; group HE (p<0.05), group CH (p<0.005) and group CO (p<0.005).

Table 15. Mean sodium intake for canteen users and non-canteen users (Post-test)

	Canteen users (mg)	Non users (mg)
Group HE	718.11 ¹	500.37 ¹
Group CH	1019.28 ²	579.22 ²
Group CO	1004.51 ³	588.82 ³

¹ ANOVA=5.24, df=1, $p < 0.05$

² Kruskal-Wallis H=10.45, df=1, $p < 0.005$

³ ANOVA=10.74, df=1, $p < 0.005$

The mean sugar intake for canteen users appeared different between groups, but not significantly so. Group CO students consumed more sugar than those in group CH, and group CH students consumed more sugar than those in group HE. The sugar consumption of non-users was similar for each group. In each group, the consumption of sugar was lower for those students that did not use the canteen. The difference proved statistically significant for groups HE and CO ($p < 0.05$ and $p < 0.01$ respectively).

Table 16. Mean sugar intake of canteen users and non-canteen users (Post-test)

	Canteen users (g)	Non users (g)
Group HE	26.97 ¹	17.07 ¹
Group CH	37.43	19.23
Group CO	41.34 ²	22.64 ²

¹ ANOVA=4.09, df=1, p<0.05

² ANOVA=7.42, df=1, p<0.01

Attitudes towards nutrition

Table 17 displays an overview of responses to the attitudinal items for the post-test. The summary highlights similarities, differences and trends. Results in detail are displayed in Appendix D.

Table 17. Summary of attitude section (Post-test)

ITEMS	COMMENTS
1. I like to eat healthy food	No differences. In all groups, most students strongly agreed or agreed.

2. Most kids who are overweight can't help it	No differences. A spread of opinion in all groups.
3. I enjoy eating fresh fruit and vegetables	No differences. Most students in each group strongly agreed or agreed.
4. School canteens should sell healthy foods	No differences. Most students in all groups strongly agreed or agreed.
5. I enjoy eating lollies and take-away foods	Significance difference ($p < 0.05$). More group CH students strongly agreed whereas more group HE students were unsure. Group CO students tended to be unsure or to agree.
6. I like cool drinks better than fruit juice	Significant difference ($p < 0.05$). More group HE students strongly disagreed or disagreed compared with groups CH and CO students who were more likely to strongly agree or agree.
7. My eating habits are healthy	No differences. All groups tended towards agreement or being unsure.
8. Food in our canteen is healthy	Significant difference ($p < 0.05$). Group HE more likely to agree compared with group CO who were more likely to disagree. Many students overall were unsure.

9. Normal milk is healthier than low-fat milk	No significant difference. A spread of responses for each group.
10. We should learn about healthy eating at school	No differences. Most students in all groups tended to strongly agree or agree.
11. I don't like eating fatty foods	No differences. A spread of responses in each group.
12. If I have a choice, I choose healthy foods	No differences. Most students in all groups tended towards agreement.
13. I like to buy food from the canteen	No differences. Most students in all groups tended towards agreement.
14. Most people who are overweight are as healthy as people who are not overweight.	No differences. A spread of responses in each group.
15. I like to buy healthy food from the canteen	No significant differences. Most students in each group strongly agreed or agreed.
16. I like to sprinkle salt on my food	No significant difference. A spread of responses although more group HE students strongly disagreed and more group CO students agreed.

17. Take-away food can be just as healthy as other food	No differences. A spread of responses with more students overall tending towards disagreement and many unsure.
---------------------------------------------------------	----------------------------------------------------------------------------------------------------------------

Findings

Use patterns of the canteen were similar for each group although group HE students tended to patronise the canteen more often. Knowledge scores were similar for each group. There was little difference between means and standard deviations.

Differences of importance were evident in dietary behaviour. Group HE students overall, consumed less fat than students in groups CH and CO. Canteen users in group HE consumed less fat than students in groups CH and CO who bought items from the canteen. Little difference in fat consumption was determined between non-canteen users. The group HE mean was the only group to fall below the RDG.

Fibre consumption was clearly different for group HE students compared with the other two groups. Overall, group HE consumed more fibre. Canteen users in group HE consumed more than those in group CO, and non-canteen users in group HE consumed more fibre than the same in group CH and CO. Each group mean fell below the RDG

range for fibre.

Within each group, those students who did not patronise the canteen consumed less sodium than their peers who bought items from the canteen. Overall, group HE students consumed less sodium than students of group CH and CO. Group HE and CH means fell below the RDG limit for sodium. Group CO students generally ate more sugar than those in group HE. For groups HE and CH, students who did not use the canteen consumed less sugar than their peers who did.

Three statistically significant differences emerged from the attitudinal section of the post-test. In response to the item that stated "I enjoy eating lollies and take-away food", groups HE and CH differed. More group CH students agreed whereas more group HE students were unsure. Group HE differed from the other groups in response to "I like cool drinks better than fruit juice". More group HE students strongly disagreed or disagreed compared with group CH and CO students who were more likely to strongly agree or agree. Group HE and group CO differed when responding to "Food in our canteen is healthy". More group HE students agreed compared with group CO where more disagreed.

Differences between Pretest and Post-test

This section explores differences in responses that occurred within each group between the pretest and post-test.

Use of the canteen

Table 18 shows there was no significant difference in the use of the canteen on the day of each data collection for any of the groups. In each case there was a trend for more students to use the canteen at the post-test, and this trend was more pronounced for group CH.

Table 18. Use of the canteen on the days of data collection (Post-test in parenthesis)

	Yes (%)	No (%)
Group HE	48.2 (57.1)	51.8 (42.9)
Group CH	35.6 (53.7)	64.4 (46.3)
Group CO	39.3 (47.3)	60.7 (52.7)

Normal weekly use of the canteen was similar for group HE and CH students. Group CO students tended to use the canteen less at the time of the post-test than the pretest. At post-test, more group CO students were not using the canteen at all, more were

using the canteen one or two days a week and less using the canteen three or more days a week. These figures were not of statistical significance.

Table 19. Normal weekly use of the canteen (Post-test in parenthesis)

	0 days (%)	1 or 2 days (%)	3 > days (%)
Group HE	14.8 (13.5)	62.9 (63.5)	22.3 (23.0)
Group CH	13.6 (13.5)	67.7 (63.5)	18.7 (23.0)
Group CO	23.0 (16.4)	45.8 (60.0)	31.2 (23.6)

Knowledge about nutrition

In each group, the mean test scores improved slightly from pretest to post-test. The changes in scores did not prove to be statistically significant.

Table 20. Mean knowledge test scores (Post-test in parenthesis)

	Mean score/20	Stand. dev.
Group HE	11.07 (12.13)	3.8 (3.56)
Group CH	12.17 (12.48)	3.58 (3.38)
Group CO	11.02 (11.66)	3.2 (3.28)

Dietary behaviour

Table 21 shows the "at school" fat consumption for all members of each group whether they patronised the canteen or not. Pretest means were similar to post-test means in each case.

Table 21. Mean percentage of total energy from fat for "at school" diet

	Pretest (%)	Post-test (%)
Group HE	26.57	23.62
Group CH	31.08	32.75
Group CO	32.75	32.12

Both canteen users and non-canteen users were examined separately to explore changes in fat consumption. In most cases fat consumption was similar for pretest and post-test.

Table 22. Mean percentage of total energy from fat, canteen users and non-canteen users (Post-test in parenthesis)

	Canteen users (%)	Non-canteen users (%)
Group HE	24.67 (24.57)	28.14 (22.9)
Group CH	34.34 (34.5)	29.14 (30.78)
Group CO	38.02 (38.89)	29.22 (29.07)

Some changes occurred to the total "at school" intake of fibre between pretest and post-test. The group HE mean decreased although not significantly. The group CH mean increased, but also at an insignificant level. The group CO mean decreased at a significant level ($p < 0.05$).

Table 23. Mean fibre intake for "at school" diet

	Pretest (g)	Post-test (g)
Group HE	10.16	6.31
Group CH	4.85	5.35
Group CO	5.39*	4.11*

* Kruskal-Wallis $H=4.13$, $df=1$, $p < 0.05$

When divided into canteen users and non-canteen users, group HE and CH showed little difference in means between the pretest and the post-test. Those that did not use the canteen in group HE appeared to consume less fibre at the post-test, but this change was not of statistical importance. Among group CO students, canteen users at pretest ate significantly less fibre than canteen users at post-tests ($p < 0.05$).

Table 24. Mean fibre intake for canteen users and non-canteen users (Post-test in parenthesis)

	Canteen users (g)	Non-canteen users (g)
Group HE	8.63 (6.91)	11.8 (5.87)
Group CH	5.39 (6.23)	4.57 (4.53)
Group CO	5.28* (4.46)*	5.46 (3.72)

* Kruskal-Wallis $H=4.84$, $df=1$, $p < 0.05$

Comparison of sodium intakes for each group in total showed little difference between pretest and post-test results (Table 25). Similarly, sodium intake for the sub-groups of canteen users and non-canteen users differed little between pretest and post-test (Table 26).

Table 25. Mean sodium intake for "at school" diet

	Pretest (mg)	Post-test (mg)
Group HE	725.71	593.11
Group CH	776.77	790.79
Group CO	784.9	808.0

Table 26. Mean sodium intake for canteen users and non-canteen users (Post-test in parenthesis)

	Canteen users (mg)	Non-canteen users (mg)
Group HE	687.9 (718.1)	705.97 (500.37)
Group CH	1056.5 (1019.28)	618.02 (579.22)
Group CO	1211.74 (1004.5)	508.03 (588.82)

Sugar intake decreased significantly for group HE students between tests ($p < 0.05$). Group CH students tended to decrease their sugar intake whereas for Group CO students the reverse occurred.

Table 27. Mean sugar intake for "at school" diet

	Pretest (g)	Post-test (g)
Group HE	36.79*	21.29*
Group CH	30.93	27.98
Group CO	28.52	32.5

* Kruskal-Wallis H=6.44, df=1, p < 0.05

No significant changes in sugar intake were revealed between tests for the sub-groups of canteen users and non-canteen users. There was a tendency among non-canteen users to consume less sugar at the post-test. Canteen users in group HE also appeared to consume less sugar at the time of the post-test. There was a tendency too, for group CO canteen users to increase their sugar intake at the post-test.

Table 28. Mean sugar intake for canteen users and non-canteen users (Post-test in parenthesis)

	Canteen users (g)	Non-canteen users (g)
Group HE	43.78 (26.97)	30.1 (17.0)
Group CH	37.43 (37.43)	27.24 (19.23)
Group CO	31.04 (41.34)	26.89 (22.64)

Attitudes towards nutrition

Table 29 displays an overview of differences in responses to the attitudinal items of the pretest and post-test. The summary highlights similarities, differences and trends. Results in detail are displayed in Appendix D.

Table 29. Summary of differences between tests for attitude section.

ITEMS	COMMENTS
1. I like to eat healthy food	Little difference between tests for any of the groups.
2. Most kids who are overweight can't help it	Little difference between tests for any of the groups.
3. I enjoy eating fresh fruit and vegetables	Little difference between tests for any of the groups.
4. School canteens should sell healthy foods	Little difference between tests for any of the groups.
5. I enjoy eating lollies and take-away foods	Little difference between tests for any of the groups.

6. I like cool drinks better than fruit juice	Significant changes ($p < 0.05$) for groups CH and CO. A shift for group CH responses from the disagreement side of the scale to the agreement side. More group CO students were unsure and less disagreed in the post-test.
7. My eating habits are healthy	Little difference between tests for any of the groups.
8. Food in our canteen is healthy	Little difference between tests for any of the groups.
9. Normal milk is healthier than low-fat milk	Little difference between tests for any of the groups.
10. We should learn about healthy eating at school	Significant changes in group CH responses ($p < 0.05$). More responses of unsure rather than agree.
11. I don't like eating fatty foods	Little difference between tests for any of the groups.
12. If I have a choice, I choose healthy foods	Little difference between tests for any of the groups.
13. I like to buy food from the canteen	Little difference between tests for any of the groups.

14. Most people who are overweight are as healthy as people who are not overweight.	Little difference between tests for any of the groups.
15. I like to buy healthy food from the canteen	Significant changes in responses for group HE and group CH. Among group HE students, there was a change from disagree to agree ($p < 0.05$). Among group CH students, less were unsure and more disagreed ($p < 0.05$).
16. I like to sprinkle salt on my food	Little difference between tests for any of the groups.
17. Take-away food can be just as healthy as other food	Significant change among group CO students. More students were unsure rather than in disagreement ($p < 0.005$).

Findings

Use patterns of the canteen were similar for both the pretest and the post-test. Knowledge scores were similar although each group showed slight improvement.

Fat and sodium consumption appeared to differ little between tests for any of the groups. Overall, sugar consumption decreased among group HE students although

significant change within the sub-groups of canteen users and non-canteen users was not evident. Fibre intake decreased overall in group CO and particularly among those who used the canteen.

Several changes were found in the attitude section. Group CH and CO responses changed for the statement "I like cool drinks better than fruit juice". More group CH students were in agreement and group CO students were unsure rather than disagreeing. Group CH responses changed for "We should learn about healthy eating at school". More were unsure and less agreed. Group HE and CH students showed changes in response to "I like to buy healthy food from the canteen". More group HE students disagreed rather than agreed. More group CH students disagreed and less were unsure. Group CO responses changed for "Take-away food can be just as healthy as other food". Fewer students disagreed and more were unsure.

CHAPTER 5

DISCUSSION

This chapter discusses the results of the study as they relate to the research questions. The research questions are restated and discussed in terms of significant findings. Implications of the results are stated and reference is made to other studies and literature where appropriate.

Research question 1. In what ways does the canteen menu affect the use of the canteen?

This study revealed no significant differences in patterns of use between the types of canteens although there was a trend for more patronage of the healthy canteens. Pretest and post-test results were similar on this matter. No other studies have explored use patterns according to canteen menu, although work by Gillespie (1981) and Glanz and Mullis (1988) suggested that availability of food was an important determinant in food choice. As patterns of use appeared similar among groups in this study, it could be assumed that a large percentage of children will use the canteen and will buy what is available to them whether or not it is of a nutritious nature.

Research into use patterns was limited to identifying whether or not students bought something from the canteen, and how often they patronised the canteen in a weekly period. More information could have been gained by recording how many items were bought and of what type, and how much money was spent.

Research question 2. Does the canteen menu affect student knowledge about nutrition?

The results indicate that student knowledge is not affected by the canteen menu. Although there was considerable difference in the nutritional value between canteen menus, knowledge scores were similar. This finding suggests that other factors are more important in influencing knowledge about nutrition. Charney and Lewis (1987) suggested that student knowledge is improved by classroom education programs. It was assumed for this study that all groups had received similar classroom programs, so it could also be assumed that knowledge scores would have been similar even though the canteen food was different.

Research question 3. In what ways does the canteen menu affect the food that children eat at school?

There were several significant differences in dietary behaviour that appeared to be dependent on the canteen menu. Differences in consumption of the selected nutrients were identified between groups, and these differences were especially evident when comparisons were made between those who did and those who did not use the canteen. The canteen clearly influenced the type of food that children ate at school and this in turn impacted on the nutrient intake of children. For example, students in groups CH and CO were able to select from a variety of high fat, high sodium foods including pies, pasties, sausage rolls and commercially produced pizzas. Group HE students were clearly advantaged in a nutritional sense because the food choices available to them enabled selection of foods low in fat and sodium and high in fibre. Simons-Morton et

al. (1988) reported on a study involving changes to food service and they also found that significant decreases in fat and sodium consumption resulted from healthy menu design. Ellison et al. (1988) showed that food service interventions involving sodium reduction and fat modification lead to decreases in blood pressure among the student population. If the results from Ellison et al. could be extrapolated to this study, it is possible that group HE students would display lower blood pressure than students in the other groups. If so, this would be an important impact of a healthy canteen menu, with long term ramifications, especially if other precursors to disease are similarly affected.

One of the most important findings of this study was that students attending a school that offered a healthy canteen menu, stood a better chance of eating less fat than those at schools where the food service offered fewer healthy food items. This occurrence could well impact upon important risk factors such as obesity and high blood cholesterol. There are also indications that students from groups CH and CO who did not buy items from the canteen consumed less fat than those who did. This figure was not significant, but could indicate that children's tastes and eating habits are influenced by the school canteen menu and this influence carries over to food selection elsewhere. These data warrant further exploration.

Fibre consumption was significantly higher for group HE students and importantly, non-canteen users in that group consumed more fibre than non-canteen users in other groups. A possible explanation for this could be that group HE students have become accustomed to eating wholemeal breads, fruit and vegetables, and choose them in preference to other foods containing less fibre. This could indicate that the canteen

menu influences food selection elsewhere, and may also affect attitudes and eating habits with short and long term benefits.

A disturbing finding was that many students consumed moderate to high levels of sodium. Group HE students fared better than students in other groups. The results showed that canteen users in groups CH and CO consumed considerably more sodium than their peers who ate non-canteen food. This is not surprising given that many food items on those menus were vendor prepared and commercially made foods such as pies, pasties and snack foods. Such foods proved to contain high amounts of sodium and are not recommended for consumption on a daily or frequent basis. Unfortunately, supplying such foods on a daily basis at school may encourage students to assume that those foods are suitable for everyday consumption.

It is difficult to draw conclusions about sugar intake. No differences between groups emerged from the pretest although the post-test results indicated that group HE students overall, ate less sugar. Unfortunately, limitations of the S.O.D.A. package became evident with regard to analysis of sugar consumption. The package did not discriminate between sugar from different sources. For example, sugars from lollies and cakes were not identified as different to sugars from fruit. Given this was the case, little analysis of value can be gleaned from the results. As a more sophisticated dietary analysis tool becomes available, closer inspection should be a priority.

Research question 4. Does the canteen menu affect student attitudes towards nutrition?

Significant differences in responses to some attitudinal items indicate that the type of canteen is associated with attitudes about nutrition. Interestingly, most children indicated that they liked to eat healthy food, that they enjoyed eating fresh fruit and vegetables and that they chose healthy food when possible. Most also felt that their eating habits were healthy, although dietary analysis and comparison with recommended goals showed that many in the study sample practised less than desirable eating habits.

Almost all of the children surveyed liked to use the canteen and most thought the school canteen should sell healthy food. This sort of information should provide strong motivation for schools to supply healthy food as it suggests that children will buy such food and profit margins will not suffer from a change to healthy food.

Several differences were revealed in attitudes that could have been influenced by canteen menus. More group CH and CO students indicated that they enjoyed eating lollies and take-away foods, while there was a tendency among group HE students to be unsure or to disagree with this. Similarly, more group CH and CO students appeared to prefer cool drinks to fruit juice. The opposite was the case for group HE students. These differences could well be a result of group CH and CO canteen menus offering lollies, take-away types of foods and soft drinks. This could indicate that student tastes and preferences have been influenced by the availability of those types of food. This has important implications for long term eating habits, given that children develop food preferences and habits early in life (Schoenberger, 1982). It could then be assumed that

children who are offered mostly healthy food in the school canteen will be more likely to develop positive attitudes towards nutritious foods.

Many children appeared to be aware of the healthiness of food offered in their school canteen. Group HE students generally considered their canteen food to be healthy whereas group CO students did not consider theirs to be healthy. Many group CH students were unsure about this point. An unexpected finding emerged from responses to "I like to buy healthy food from the canteen". While most students generally agreed and strongly agreed with the statement, in the pretest a significant number of group HE students disagreed. As no real change occurred in the group HE canteen menus, this discrepancy could be a result of student change.

Research question 5. Does a change in canteen menu affect a) the use of the canteen, b) knowledge about nutrition, c) the food children eat, or d) attitudes towards nutrition?

This question is difficult to address as little change occurred to canteen menus in the two schools in group CH. Changes were limited to two items being added to the recess menu. One school included yoghurt and noodles, and exchanged fruit buns for donuts. The other school added fruit and sultanas to the recess list. While these additions were of a nutritional nature, the bulk of the menu remained unaltered and no other high fat and salt items were removed or changed. In both group CH schools, some resistance was encountered when healthy change was suggested. In both cases, it appeared that the canteen managers and committees were not committed to change and felt that

convenience and profit would suffer if pastry foods and snack foods were removed from the menu. Although members of the teaching staff were enthusiastic about the adoption of a healthy canteen policy, the canteen managers and their committees were the decision makers on this issue.

Use patterns for each group altered little between the test periods although there was a slight tendency for less group CO students to patronise the canteen. Many schools offer a slightly different menu for the summer and winter seasons as occurred in group HE schools. Group CO menus were not changed at all so it is likely that students in group CO become less inclined to buy hot food when offered in the summer season, especially as the menu appeared to have no new appeal.

The types of food chosen and consequently the nutrient intake for students changed very little between test periods. This is not surprising given that the type of food offered remained very similar in each group. Sodium and fat intakes were similar for all groups. Fibre consumption remained similar for groups HE and CH, but decreased for group CO. There was no change at all to the group CO menu which makes it difficult to draw conclusions about why this change occurred. Sugar intake decreased for group HE students, but as already acknowledged, the S.O.D.A. package did not discriminate between different sources of sugar so it is difficult to identify the reason for the change.

Several changes emerged in the attitudinal section. When asked to respond to the statement "I like cool drinks better than fruit juice", there was a shift among group CH students away from disagreement to agreement. A shift from disagreement to unsure

was evident in group CO. Both changes suggest a general decline of positive attitudes towards good nutrition. A similar change was seen in response to "Take-away food can be just as healthy as other food". Among group CO students there was a shift from disagree to unsure. If those schools persisted with the current menus, worsening attitudes towards nutrition may well be evident as time progresses.

Change in group CH was also shown with regards to the statement "We should learn about healthy foods at school" where there was a shift from agreement to unsure. As mentioned previously, there was resistance to nutritional improvement in the canteen menus by canteen managers and their committees in group CH schools. This ill-feeling could have created feelings of uncertainty about the need for nutritious canteen food and nutrition education generally. The same circumstances can explain another shift in opinion among group CH students. There was a shift from unsure to disagree in response to the statement "I like to buy healthy food from the canteen".

In conclusion, the effect of change in canteen menu could not be properly addressed in this study. It could be assumed that there would be positive change over time if group CH and CO canteens adopted similar practices as those of group HE canteens. Such change would require quite radical changes to the attitudes of the decision makers before alterations to planning, menu design, food preparation and promotion could occur. It is possible that this process would take some time if change was to be accepted by all members of the school community, including the students who have become accustomed to the type of menu currently being offered. It would be interesting

to ascertain the effect of menu change on students' use of the canteen and their attitudes and eating habits considering that they had been experiencing a less than nutritious menu selection for several years. It may be that ten-year-old children have already established firm attitudes about food and have definite food preferences.

An interesting finding that was outside the research questions for the study was that in many cases, children who brought food from home appeared to eat more nutritious food. Nutrition programs organised in schools may benefit by promoting the consumption of nutritious and inexpensive food prepared at home.

CHAPTER 6

SUMMARY AND RECOMMENDATIONS

This study was concerned primarily with the effect of canteen menu on children's knowledge about nutrition, their attitudes towards nutrition and their eating habits at school. Results indicate that the canteen menu appears to influence children's attitudes and behaviour although not on their knowledge about nutrition. The ultimate goal of health education and health promotion is to positively change health behaviours or to reinforce existing healthy behaviours. Therefore it can be concluded that the canteen menu and practice have significant impact on the health of children.

With reference to the conceptual framework adopted for this study, the canteen appears to be an important Enabling factor in that it has significant influence on availability and accessibility of food in the school environment. In addition, it appears that the canteen menu is an important Reinforcing factor. The availability of different food types may reinforce attitudes and behaviours that the children have developed at school and at home. It can be assumed from other studies where outcome evaluation of school canteen menu was examined, that the menu could affect the health status of individuals. According to the conceptual model, the quality and length of life may be influenced as a consequence.

This study indicates that a number of issues need to be addressed by decision making personnel who are concerned with school canteens. Recommendations for change are suggested.

Canteen food should be of a nutritious nature and support nutrition education programs taught in the classroom.

School canteens are a part of the school community where education is the primary objective. Canteens should be organised to complement the curriculum, not contradict the work of teachers. Classroom instruction enables students to establish an understanding of good nutrition and develop values about food. The canteen is an important avenue for reinforcement of those values and consequently the formation of healthy eating habits. The results of this study indicate that healthy canteen menus affect the fat, sodium and fibre intake of students. The reduction of fat and sodium, and the increase of fibre in the diet are clearly goals that teachers aim to achieve through classroom instruction.

High-fat, high-salt snack foods should not be sold in school canteens on a regular basis. Pies, pasties, sausage rolls and other snack foods are of poor nutritional value. Students in this study who were able to purchase those high-fat and high-salt foods from their school canteen, consumed significantly more fat and sodium than other students. Foods that are high in fat and/or salt, such as many pastry items and snack foods, can be detrimental to an individual's health and should not be considered as suitable "everyday" food. If these foods are sold at the canteen on a daily basis, not only may some children suffer as a result, but all children may come to consider these foods acceptable for everyday consumption.

Health and education authorities should issue directives concerning the types of food suitable for sale at school canteens. At present there are no directives or guidelines for school canteen committees. Each school is at liberty to establish its own standards and set its own priorities. It appears that in many cases the decision-makers do not have a background in either nutrition or education, and often there is limited or no consultation with teaching staff at the school. This situation allows committees to place profit and expedience ahead of student health when establishing priorities. A policy from a health or education authority would clearly outline the responsibilities and priorities to be considered by canteen planning committees.

Members of the school community need to work together to develop a healthy canteen policy. No individual or single group should make decisions on canteen matters. All sections of the school community should be represented on a working party to direct the canteen's operation. By including representation from parents, teachers, students and canteen staff, all interests can be considered. Issues such as food preference, nutrition and education would be better addressed through consultation with a range of members of the school community. Such a group should develop a healthy canteen policy that guides present and future operations of the canteen.

Canteen managers need to acquire knowledge about good nutrition and skills relating to preparation and promotion of nutritious food. At present, canteen managers are not required to have any formal training related to their job role. However, they are required to make many decisions that may directly affect the health of children. Canteen managers require specific skills including healthy food preparation,

advertising, promotion and menu design, in addition to understanding the nutritional value of different foods. With such knowledge and skills, the manager should be able to operate a nutritional and profitable food service.

The final three recommendations relate to issues requiring further research that arose during the course of this study.

Further research should investigate the effect of canteen menu on other nutrients outside the scope of this study including sugars. Only four nutrients were selected for analysis in this study, however many nutrients combine to influence the health of children. This study attempted to explore sugar intake but analysis techniques were inadequate for producing useful results.

Research should be extended to investigate the influence of canteen menu on other age groups, other socio-economic groups and country areas. This study examined a specific group of similar age and socio-economic status and was conducted in suburban Perth. Therefore, results may not be generalisable to other groups of school children.

Further research should investigate the impact of a healthy school food service on children's blood pressure, blood cholesterol levels and other precursors to disease. This study indicates that the canteen menu affects consumption of some nutrients at school, particularly fat, sodium and fibre. Further research should explore the longer term outcomes of canteen menu such as blood pressure and blood cholesterol levels.

APPENDIX A FOOD QUESTIONNAIRE

This questionnaire is in two parts. Part A and Part B. Try to answer every question as best you can. Your answers will help us understand what you think about food and nutrition.

Example 1

Tick the box which shows how you feel.

Apples taste nice.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
-------------------	-------	--------	----------	----------------------

Example 2

Circle the best answer.

How much does an apple cost.

- (a) About 2 cents.
- (b) About 40 cents.
- (c) About 1 dollar.
- (d) About 2 dollars.

PART A

Firstly we need to know a little bit of information about you.

What school do you go to ?

In what suburb do you live ?

Are you a boy or a girl ? Boy [] Girl []

Did you buy food from the canteen today ? Yes [] No []

How many days in the week do you usually buy food from the canteen ? []

1. I like to eat healthy food.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
-------------------	-------	--------	----------	----------------------

2. Most kids who are overweight can't help it.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
-------------------	-------	--------	----------	----------------------

3. I enjoy eating fresh fruit and vegetables.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
-------------------	-------	--------	----------	----------------------

4. School canteens should sell healthy foods.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
-------------------	-------	--------	----------	----------------------

5. I enjoy eating lollies and take-away foods.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
-------------------	-------	--------	----------	----------------------

6. I like cool drinks better than fruit juice.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

7. My eating habits are healthy.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

8. Food in our school canteen is healthy.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

9. Normal milk is healthier than low fat milk.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

10. We should learn about healthy eating at school.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

11. I don't like eating fatty foods.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

12. If I have a choice, I choose healthy foods.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

13. I like to buy food from the canteen.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

14. Most people who are overweight are as healthy as people who are not overweight.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

15. I like to buy healthy food from the canteen.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

16. I like to sprinkle salt on my food.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

17. Take-away food can be just as healthy as other food.

Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
----------------	-------	--------	----------	-------------------

PART B

Choose the **BEST** answer for the questions in this section.
Circle the **BEST** answer.

1. A healthy diet contains
 - (a) plenty of milk
 - (b) a little bit of sugar
 - (c) food from the five food groups
 - (d) plenty of meat and fish.
2. Take-away foods often have a lot of
 - (a) vitamins and minerals
 - (b) fat, sugar and salt
 - (c) protein
 - (d) carbohydrates.
3. Fruit and vegetables do NOT contain a lot of
 - (a) fibre
 - (b) vitamins
 - (c) minerals
 - (d) fat.
4. Kids will put on weight if
 - (a) they eat more than anyone else in the class
 - (b) they exercise only once or twice a week
 - (c) their family are overweight
 - (d) they eat more than they need to each day.
5. Meals which have a lot of meat, cheese and eggs and no fruit and vegetables are
 - (a) high in fibre and low in fat
 - (b) high in fibre and high in fat
 - (c) low in fibre and low in fat
 - (d) low in fibre and high in fat.
6. Eating a lot of sugar
 - (a) makes you energetic
 - (b) is OK for kids
 - (c) can cause tooth decay
 - (d) can cause cancer.

7. What kinds of food should you eat most of every day ?
 - (a) fruit and vegetables
 - (b) meat
 - (c) milk and milk products
 - (d) fish and chicken.
8. What kinds of food help you grow strong bones and teeth ?
 - (a) meat
 - (b) fruit and vegetables
 - (c) milk and milk products
 - (d) bread and cereals.
9. Which kinds of foods should be eaten in small amounts only ?
 - (a) fruit and vegetables
 - (b) butter and margarine
 - (c) meat and fish
 - (d) milk and milk products.
10. Which problem is NOT caused by eating too much fat ?
 - (a) tooth decay
 - (b) heart disease
 - (c) overweight
 - (d) stroke.
11. Wholegrain bread is better than white bread because
 - (a) it has less calories
 - (b) it has more fibre
 - (c) it has less protein
 - (d) it has less preservatives.
12. Which food contains the most amount of fat ?
 - (a) chocolate
 - (b) potatoes
 - (c) baked beans
 - (d) lollies.

13. Vegetables and fruit are healthiest when they are
- (a) fried
 - (b) baked
 - (c) stewed
 - (d) raw or steamed.
14. Eating too much salt can cause
- (a) overweight
 - (b) some types of cancer
 - (c) high blood pressure
 - (d) tooth decay.
15. Which food contains the LEAST amount of salt ?
- (a) pizza
 - (b) ham or bacon
 - (c) cheese
 - (d) steak.
16. Which food does NOT belong to the bread and cereals group ?
- (a) spaghetti
 - (b) rice
 - (c) wholemeal buns
 - (d) beans.
17. How often should we eat fruit and vegetables ?
- (a) 1 serve each day
 - (b) 1 serve at least twice a week
 - (c) 1 serve at least five times a week
 - (d) 4 serves a day.
18. Meat, eggs, fish and nuts all contain
- (a) sugar
 - (b) fibre
 - (c) protein
 - (d) vitamin C.

19. Skim milk contains
- (a) less fat than normal milk
 - (b) less sugar than normal milk
 - (c) less calcium than normal milk
 - (d) more fat than normal milk.
20. Some diseases can be affected by the types of food we eat. Which disease is NOT affected by the food we eat ?
- (a) heart disease
 - (b) stomach cancer
 - (c) lung cancer
 - (d) diabetes.

THANK YOU FOR YOUR HELP

APPENDIX B

Instructions for dietary analysis procedure.

Introduction

1. Make the participants feel at ease. Explain that everyone in the class is going to help find out what Year Five students eat at school.
2. Ask the students to record everything that they have eaten at school that day. Ask them to include snacks and drinks.
3. Explain that it is important to include as much information about the types and amounts of foods eaten.
4. Show the students the standard measures to be used, for example; cup, half-cup, tablespoon, teaspoon.

Recording

1. Ask the students to write the food under the headings given, for example; morning recess, lunch etc.

2. Use the following probe questions to elicit more detail:

a) Meat, fish eggs, poultry - How was the food cooked (baked, fried)?.

b) Bread - what type ? What type of spread ? (butter, margarine, jam etc.).

c) Mixed dishes - What ingredients ?

d) Vegetables - What type ? How were they cooked ? Did they have butter, dressing or seasoning on them ?

e) Coffee/tea/milo - Was there milk or sugar added ? How many teaspoons?

f) Cereals - What type ? How much and what type of milk was added ?

g) Fruit - What type ? Was it peeled or cooked ?

h) Take-away foods - What brand ?

3. Use an example to help students understand the amount of information required.

For example: Breakfast - 2 pieces of white bread, toasted, 1 tablespoon of strawberry jam on each and 1 teaspoon of margarine on each. 1 cup of 35% orange fruit juice drink.

4. Ask students to make a special note of any foods bought at the canteen. Place a tick next to them.
5. Remind students about extras that they might have had. For example, a bite of a friend's apple.

NOTE: Comments made should be non-judgemental. Assure the students that it is alright to record anything and everything they ate.

APPENDIX C

Health Education K-10 Syllabus; objectives related to nutrition, Years K-4.

Pre-primary

- * Students discuss the need for nutritious food.
- * Students establish that eating habits are affected by the choice of food and the social patterns of eating.

Year One

- * Students establish the need for good eating practices, and discuss how these affect health.
- * Students establish that eating habits are affected by the choice of food and the social patterns of eating.

Year Two

- * Students identify the components of healthy physical growth.

Year Three

- * Students discuss the need for food and the importance of a varied diet.
- * Students identify the relationship between food and activity.
- * Students relate how personal preferences affect the selection of food.
- * Students describe the relationship between lifestyle and diet.

Year Four

- * Students classify food into the five food groups, and state the necessity for a balanced and varied diet.
- * Students research and discuss some of the factors that affect individual eating habits.

APPENDIX D

RESULTS IN DETAIL FOR RESPONSES TO

ATTITUDINAL SECTION OF QUESTIONNAIRE

Table 30a. Responses to "I like to eat healthy food" (Pretest).

	SA	A	U	D	SD	Total
Group HE	34	15	3	0	2	54
Group CH	25	26	7	0	1	59
Group CO	34	19	5	2	1	61
Total	93	60	15	2	4	174

Table 30b. Responses to "I like to eat healthy food" (Post-test).

	SA	A	U	D	SD	Total
Group HE	24	22	3	3	2	54
Group CH	20	22	8	0	4	54
Group CO	21	25	6	2	1	55
Total	65	69	17	5	7	163

Table 31a. Responses to "Most kids who are overweight can't help it" (Pretest).

	SA	A	U	D	SD	Total
Group HE	10	11	12	14	7	54
Group CH	20	16	8	10	5	59
Group CO	9	18	13	18	3	61
Total	39	45	33	42	15	174

Table 31b. Responses to "Most kids who are overweight can't help it" (Post-test).

	SA	A	U	D	SD	Total
Group HE	13	10	9	10	11	53
Group CH	13	12	11	9	9	54
Group CO	6	16	17	10	6	55
Total	32	38	37	29	26	162

Table 32a. Responses to "I enjoy eating fresh fruit and vegetables" (Pretest).

	SA	A	U	D	SD	Total
Group HE	35	10	4	2	3	54
Group CH	26	25	3	3	1	58
Group CO	37	17	2	2	2	60
Total	98	52	9	7	6	172

Table 32b. Responses to "I enjoy eating fresh fruit and vegetables" (Post-test).

	SA	A	U	D	SD	Total
Group HE	28	20	2	2	1	53
Group CH	23	20	6	4	1	54
Group CO	35	17	0	2	1	55
Total	86	57	8	8	3	162

Table 33a. Responses to "School canteens should sell healthy food" (Pretest)

	SA	A	U	D	SD	Total
Group HE	37	10	2	3	2	54
Group CH	29	22	2	5	1	59
Group CO	32	15	3	7	4	61
Total	98	47	7	15	7	174

Table 33b. Responses to "School canteens should sell healthy food" (Post-test).

	SA	A	U	D	SD	Total
Group HE	29	15	5	0	3	52
Group CH	23	18	7	4	2	54
Group CO	25	19	7	1	3	55
Total	77	52	19	5	8	161

Table 34a. Responses to "I enjoy eating lollies and take-away foods". (Pretest)

	SA	A	U	D	SD	Total
Group HE	9	12	14	7	12	54
Group CH	16	25	9	5	4	59
Group CO	24	17	13	3	3	60
Total	49	54	36	15	19	173

Chi square=24.09, df=8, $p < 0.01$

Table 34b. Responses to "I enjoy eating lollies and take-away foods". (Post-test)

	SA	A	U	D	SD	Total
Group HE	10	11	21	4	7	53
Group CH	20	15	9	8	2	54
Group CO	13	18	17	3	3	54
Total	43	44	47	15	12	161

Chi square=18.42, df=8, $p < 0.05$

Table 35a. Responses to "I like cool drinks better than fruit juices" (Pretest).

	SA	A	U	D	SD	Total
Group HE	10	8	11	10	14	53
Group CH	12	13	9	16	9	59
Group CO	19	14	7	16	3	59
Total	41	35	27	42	26	171

Table 35b. Responses to "I like cool drinks better than fruit juices" (Post-test).

	SA	A	U	D	SD	Total
Group HE	11	9	8	13	12	53
Group CH	20	10	15	6	3	54
Group CO	15	13	16	4	7	55
Total	46	32	39	23	22	162

Chi square=19.81, df=8, $p < 0.05$

Note: Group CH and group CO results differed between tests

Group CH Chi square=11.24, df=4, $p < 0.05$.

Group CO Chi square=13.64, df=4, $p < 0.05$.

Table 36a. Responses to "My eating habits are healthy" (Pretest).

	SA	A	U	D	SD	Total
Group HE	20	17	11	6	0	54
Group CH	13	24	17	3	1	58
Group CO	23	22	10	5	1	61
Total	56	63	38	14	2	173

Table 36b. Responses to "My eating habits are healthy" (Post-test).

	SA	A	U	D	SD	Total
Group HE	14	21	12	3	3	53
Group CH	18	13	19	3	1	54
Group CO	16	19	17	1	1	54
Total	48	53	48	7	5	161

Table 37a. Responses to "Food in our canteen is healthy" (Pretest).

	SA	A	U	D	SD	Total
Group HE	13	6	21	10	4	54
Group CH	5	10	20	18	6	59
Group CO	2	8	17	27	7	61
Total	20	24	58	55	17	174

Chi square=19.8, df=8, $p < 0.05$

Table 37b. Responses to "Food in our canteen is healthy" (Post-test).

	SA	A	U	D	SD	Total
Group HE	8	15	19	4	7	53
Group CH	3	8	23	11	8	53
Group CO	2	7	22	16	8	55
Total	13	30	64	31	23	161

Chi square=17.98, df=8, $p < 0.05$

Table 38a. Responses to "Normal milk is healthier than low-fat milk" (Pretest).

	SA	A	U	D	SD	Total
Group HE	14	5	8	12	15	54
Group CH	19	8	10	17	5	59
Group CO	12	8	21	14	5	60
Total	45	21	39	43	25	173

Chi square = 18.85, df = 8, $p < 0.05$

Table 38b. Responses to "Normal milk is healthier than low-fat milk" (Post-test).

	SA	A	U	D	SD	Total
Group HE	9	6	14	10	14	53
Group CH	14	7	13	9	10	53
Group CO	5	13	20	11	6	55
Total	28	26	47	30	30	161

Table 39a. Responses to "We should learn about healthy eating at school" (Pretest).

	SA	A	U	D	SD	Total
Group HE	34	13	2	2	3	54
Group CH	26	29	2	0	2	59
Group CO	27	22	6	2	3	60
Total	87	64	10	4	8	173

Table 39b. Responses to "We should learn about healthy eating at school" (Post-test).

	SA	A	U	D	SD	Total
Group HE	28	19	2	1	2	52
Group CH	23	17	10	2	1	53
Group CO	26	21	3	3	2	55
Total	77	57	15	6	5	160

Note: Group CH responses differed between tests.

Chi square=10.69, df=4, $p < 0.05$.

Table 40a. Responses to "I don't like eating fatty foods" (Pretest).

	SA	A	U	D	SD	Total
Group HE	19	8	7	9	10	53
Group CH	15	18	14	7	4	58
Group CO	13	20	7	9	9	58
Total	47	46	28	25	23	169

Table 40b. Responses to "I don't like eating fatty foods" (Post-test).

	SA	A	U	D	SD	Total
Group HE	17	7	13	9	6	52
Group CH	12	9	11	15	5	52
Group CO	11	16	14	5	8	54
Total	40	32	38	29	19	158

Table 41a. Responses to "If I have a choice, I choose healthy foods." (Pretest).

	SA	A	U	D	SD	Total
Group HE	26	18	6	4	0	54
Group CH	22	18	15	3	1	59
Group CO	29	10	14	4	2	59
Total	77	46	35	11	3	172

Table 41b. Responses to "If I have a choice, I choose healthy foods." (Post-test).

	SA	A	U	D	SD	Total
Group HE	24	21	3	4	1	53
Group CH	16	14	12	6	2	50
Group CO	19	22	9	3	2	55
Total	59	57	24	13	5	158

Table 42a. Responses to "I like to buy food from the canteen" (Pretest).

	SA	A	U	D	SD	Total
Group HE	13	15	14	5	4	51
Group CH	18	22	13	2	4	59
Group CO	24	20	9	6	1	60
Total	55	57	36	13	9	170

Chi square=16.82, df=8, $p < 0.05$

Table 42b. Responses to "I like to buy food from the canteen" (Post-test).

	SA	A	U	D	SD	Total
Group HE	11	22	10	3	6	52
Group CH	21	17	8	4	2	52
Group CO	19	14	14	5	2	54
Total	51	53	32	12	10	158

Table 43a. Responses to "Most people who are overweight are as healthy as people who are not overweight" (Pretest).

	SA	A	U	D	SD	Total
Group HE	4	5	14	12	19	54
Group CH	6	13	20	8	12	59
Group CO	3	9	16	15	16	59
Total	13	27	50	35	47	172

Table 43b. Responses to "Most people who are overweight are as healthy as people who are not overweight" (Post-test).

	SA	A	U	D	SD	Total
Group HE	6	8	10	15	14	53
Group CH	7	10	21	6	9	53
Group CO	11	7	13	9	14	54
Total	24	25	44	30	37	160

Table 44a. Responses to "I like to buy healthy food from the canteen" (Pretest).

	SA	A	U	D	SD	Total
Group HE	25	14	4	10	1	54
Group CH	22	20	15	1	0	58
Group CO	22	22	9	6	1	60
Total	69	56	28	17	2	172

Table 44b. Responses to "I like to buy healthy food from the canteen" (Post-test).

	SA	A	U	D	SD	Total
Group HE	22	23	4	1	3	53
Group CH	18	19	5	9	1	52
Group CO	23	18	7	4	2	54
Total	63	60	16	14	6	159

Note: Groups HE and CH responses differed between tests.

Group HE Chi square=10.74, df=4, $p < 0.05$

Group CH Chi square=13.63, df=4, $p < 0.05$

Table 45a. Responses to "I like to sprinkle salt on my food." (Pretest)

	SA	A	U	D	SD	Total
Group HE	6	8	8	13	18	53
Group CH	5	14	12	15	13	59
Group CO	8	17	11	7	17	60
Total	19	39	31	35	48	172

Table 45b. Responses to "I like to sprinkle salt on my food." (Post-test)

	SA	A	U	D	SD	Total
Group HE	7	9	6	9	22	53
Group CH	6	12	13	8	12	51
Group CO	4	20	10	8	13	55
Total	17	41	29	25	47	159

Table 46a. Responses to "Take-away food can be just as healthy as other food".

(Pretest)

	SA	A	U	D	SD	Total
Group HE	5	9	9	8	23	54
Group CH	10	9	10	13	17	59
Group CO	8	12	8	23	8	59
Total	23	30	17	44	48	172

Chi square=17.4, df=8, $p < 0.05$

Table 46b. Responses to "Take-away food can be just as healthy as other food".

(Post-test)

	SA	A	U	D	SD	Total
Group HE	7	7	14	13	12	53
Group CH	6	11	17	6	13	53
Group CO	6	10	17	6	13	52
Total	19	28	48	25	38	158

Note: Group CO responses differed between tests.

Chi square=14.25, df=4, $p < 0.005$

APPENDIX E

School menus

GROUP HE (School 1) [Pre-test]

RECESS

Half vegemite roll
 Half peanut paste roll
 Jubilee twist
 Yogo
 Frugo
 Fruit
 Carrot/celery sticks
 Muffins
 Pikelets

SANDWICHES AND ROLLS

Cheese and salad
 Egg and salad
 Ham and Salad
 Chicken and salad
 Tuna and salad

LUNCH FOOD

Egg/bacon pie and salad
 Chicken salad tray
 Tuna salad tray
 Soup and bun
 Fresh hot chicken roll

DRINKS

Flavoured milks
 Refresh
 Orange juice

GROUP HE (School 1) [Post-test]

RECESS

Half vegemite roll
 Half peanut paste roll
 Baked bean jaffle
 Fruit bread
 Pikelets
 Muffins
 Sultanas
 Jelly cup
 Yogo
 Fruit
 Licorice

SANDWICHES AND ROLLS

Tuna and salad
 Curried egg
 Sultana and apple

LUNCH FOOD

Hot mince roll
 Hamburger and salad
 Toasted cheese and tomato roll

DRINKS

Plain milk
 Fruit juice
 Flavoured milks

GROUP HE (School 2) [Pre-test]**RECESS**

Cheesie
Fruit
Half vegemite roll
Half peanut paste roll
Muffin
Yoghurt
Dairy snack

SANDWICHES AND ROLLS

Vegemite
Peanut paste
Salad
Cheese and salad
Egg and salad
Toasted ham and cheese
Toasted tomato and cheese
Toasted ham and tomato

LUNCH FOOD

Ricotta cheese/spinach roll
Quiche
Hot chicken roll
Hot ham and cheese roll
Hot ham cheese/pineapple roll
Homemade pizza
Corn on the cob

DRINKS

Refresh
Flavoured milks
Orange juice
Plain milk

ALSO

Fruit
Yoghurt
Carrot cake
Banana cake

GROUP HE (School 2) [Post-test]**RECESS**

Half vegemite roll
Half peanut paste roll
Scones
Cake of the day
Pikelets
Pizza toast
Yoghurt
Dairy snack
Fruit wedges

SANDWICHES AND ROLLS

Chicken and salad
Ham and salad
Salad
Vegemite
Peanut paste
Baked beans
Egg and salad
Cheese and salad

LUNCH FOODS

Salad plate
Ricotta cheese/spinach roll
Hot chicken rolls
Corn on the cob
Homemade pizza

DRINKS

Refresh
Flavoured milks
Orange juice
Plain milk

ALSO

Popcorn
Frosty fruits
Frozen yoghurt
Rollups

GROUP CH (School 1) [Pre-test]**RECESS**

Muesli bar
Sultanas
Licorice
Coconut balls
Yogo
Burger rings
Cheezels
Twistees
Cheesie
Ovalteenies
Choc Buds

SANDWICHES AND ROLLS

Peanut paste
Vegemite
Tomato
Cheese
Baked beans
Spaghetti
Egg
Ham
Chicken

LUNCH FOOD

Hot dog and sauce
Pie
Patie
Sausage roll
Party pie
Crumbed sausage
Fish finger and bread
Pizza
Donut

DRINKS

Refresh
Flavoured milks
Cordial

GROUP CH (School 1) [Post-test]**RECESS**

Muesli bar
Sultanas
Licorice
Coconut balls
Yogo
Burger rings
Cheezels
Twistees
Cheesie
Ovalteenies
Choc Buds
Yoghurt
Noodles

SANDWICHES AND ROLLS

Peanut paste
Vegemite
Tomato
Cheese
Baked beans
Spaghetti
Egg
Ham
Chicken

LUNCH FOOD

Hot chicken roll
Pie
Patie
Sausage roll
Party pie
Crumbed sausage
Fish finger and bread
Pizza
Fruit bun

DRINKS

Refresh
Flavoured milks
Cordial

GROUP CH (School 2) [Pre-test]**RECESS**

Half peanut paste roll
 Half vegemite roll
 Cheesie
 Jelly cup
 Cakes
 Donut
 Yogo

SANDWICHES AND ROLLS

Ham and cheese
 Tuna
 Egg
 Chicken and salad
 Vegemite
 Peanut paste
 Toasted baked beans
 Toasted cheese
 Toasted ham
 Toasted ham and tomato
 Toasted ham and cheese

LUNCH FOOD

Pie
 Pastie
 Sausage roll
 Crumbed sausage
 Chiko roll
 Hot ham and cheese roll
 Hot chicken roll

DRINKS

Flavoured milks
 Refresh
 Punch and Juicy
 Orange juice

GROUP CH (School 2) [Post-test]**RECESS**

Half peanut paste roll
 Half vegemite roll
 Cheesie
 Jelly cup
 Cakes
 Donut
 Yogo
 Fruit
 Sultanas

SANDWICHES AND ROLLS

Ham and cheese
 Tuna
 Egg
 Chicken and salad
 Vegemite
 Peanut paste
 Toasted baked bean
 Toasted ham and tomato
 Toasted ham and cheese
 Toasted cheese
 Toasted ham

LUNCH FOOD

Pie
 Pastie
 Sausage roll
 Crumbed sausage
 Chiko Roll
 Hot ham and cheese roll
 Hot chicken roll

DRINKS

Flavoured milks
 Refresh
 Punch and Juicy
 Orange juice

GROUP CO (School 1) [Pre-test]**RECESS**

Half vegemite roll
 Half peanut paste roll
 Donut
 Vanilla slice
 Chocolate slice
 Cheesie

SANDWICHES AND ROLLS

Ham
 Ham and salad
 Beef
 Polony
 Egg
 Beef and pickles
 Vegemite
 Peanut paste

LUNCH FOOD

Pie
 Pastie
 Sausage roll
 Party pie
 Pizza slice
 Hamburger
 Chiko roll
 Hot chicken roll
 Fish burger
 Yummy drummy

DRINKS

Flavoured milks
 Orange juice
 Coke
 Fanta
 Lemonade

ALSO

Potato crisps
 Bacon and chicken snacks
 Assorted icecreams

GROUP CO (School 1) [Post-test]**RECESS**

Half vegemite roll
 Half peanut paste roll
 Donut
 Vanilla slice
 Chocolate slice
 Cheesie

SANDWICHES AND ROLLS

Ham
 Ham and salad
 Beef
 Polony
 Egg
 Beef and pickles
 Vegemite
 Peanut paste

LUNCH FOOD

Pie
 Pastie
 Sausage roll
 Party pie
 Pizza slice
 Hamburger
 Chiko roll
 Hot chicken roll
 Fish burger
 Yummy drummy

DRINKS

Flavoured milks
 Orange juice
 Coke
 Fanta
 Lemonade

ALSO

Potato crisps
 Bacon and chicken snacks
 Assorted icecreams

GROUP CO (School 2) [Pre-test]**RECESS**

Cheesie
 Peanut paste slice
 Vegemite slice
 Fairy bread
 Half crumbed sausage
 Crumpet
 Pikelets
 Savoury biscuits

SANDWICHES AND ROLLS

Egg
 Curried egg
 Tuna
 Ham
 Cheese
 Chicken
 Peanut paste
 Vegemite
 (Salad extra)
 Toasted combinations of:
 Ham
 Cheese
 and Tomato

LUNCH FOOD

Pie
 Pastie
 Sausage roll
 Hot dog
 Crumbed sausage
 Chiko roll
 Chicken finger
 Hot chicken roll
 Jumbo yumbos
 Party pie
 Pizza

DRINKS

Juices (35%)
 Flavoured milks

EXTRAS

Licorice
 Potato crisps
 Twistees
 Muesli bar
 Cup pole
 Icy poles

GROUP CO (School 2) [Post-test]**RECESS**

Cheesie
 Peanut paste slice
 Vegemite slice
 Fairy bread
 Half crumbed sausage
 Crumpet
 Pikelets
 Savoury biscuits

SANDWICHES AND ROLLS

Egg
 Curried egg
 Tuna
 Ham
 Cheese
 Chicken
 Peanut paste
 Vegemite
 (Salad extra)
 Toasted combinations of:
 Tomato
 Cheese
 and Ham

LUNCH FOOD

Pie
 Pastie
 Sausage roll
 Hot dog
 Crumbed sausage
 Chiko Roll
 Chicken finger
 Hot chicken roll
 Jumbo yumbo
 Party pie
 Pizza

DRINKS

Juices (35%)
 Flavoured milks

EXTRAS

Licorice
 Potato crisps
 Twistees
 Muesli bar
 Cup pole
 Icy poles

REFERENCES

- Allen, B. & Amanatidis, S. (1990). Report of the school canteen improvement programme. Sydney, Unpublished manuscript.
- American Heart Association. (1980). School nutrition program guide. Texas.
- Australian Bureau of Statistics. (1988). Construction of an indicator of socio-economic status. (Information paper No.15.)
- Australian Health Ministers Advisory Council. (1988). Health for all Australians. Canberra: Australian Government Printing Service.
- Australian Nutrition Foundation. (1985). The complete canteen book. Australia: Reed.
- Bailes, J. (1982). No teacher had the right to tell my child what to eat ! Classroom Magazine, 2(1), 3-15.
- Bates, I.J. & Wynder, A.E. (1984). Introduction to health education. California: Mayfield.
- Bradford Health Authority. (1985) A survey of tuckshops in British schools. United Kingdom, Unpublished manuscript.

Cameron, H., Mutter, G. & Hamilton, N. (1991). Comprehensive school health.

Health Promotion, Spring, 2-6.

Charney, M. & Lewis, P.A. (1987). Does health knowledge affect eating habits ?

Health Education Journal, 46(4), 172-176.

Cohen, L. & Manion, L. (1980). Research methods in education. London: Croom Helm.

Commonwealth Department of Health. (1988). Dietary guidelines for Australians.

Canberra: Australian Government Publishing Service.

Commonwealth Department of Health. (1987). Towards better nutrition for

Australians. Canberra: Australian Government Publishing Service.

Curtis, S. (1988). Tuckshops and healthy eating: A second survey. Education and

Health, December, 105-108.

Downey, A.M., Virgilio, S.J., Serpas, D. C., Nicklas, T.A. Arbeit, M.L. &

Berenson, G.S. (1988). Heart Smart - A staff development model for a school-based cardio-vascular health intervention. Health Education April/May, 12-20.

Education Department of Western Australia. (1986). Health education K-10 syllabus,
Perth: Government Printer.

Ellison, P.C., Capper, A.L., Goldberg, R.J., Witschi, J.C. & Stare, F.J. (1988).
The environmental component: Changing school food service to promote
cardiovascular health. Health Education Quarterly, 112-125.

Evanson, E. & Woods, R. (1989). Poor children - poor diets. School meals in
Northern Ireland. Health Education Journal, 48(1), 36-38.

Fisher, K.F., Howat, P.A., Binns, C.W. & Liveris, M. (1986) Health education
and health promotion an Australian perspective. Health Education Journal,
45(2), 95-98.

Gay, L.R. (1987). Educational research. Competencies for analysis and application.
Columbus, Ohio: Merrill.

Gillespie, A.H. (1981). A theoretical framework for studying school nutrition
education programs. Journal of Nutrition Education, 13(4), 150-152.

Glanz, K. & Mullis, R.M. (1988). Environmental interventions to promote healthy
eating: A review of models, programs, and evidence. Health Education
Quarterly, Winter, 395-411.

- Gliksman, M.D., Dwyer, T. & Boulton, J.C. (1987). Should the primary prevention of coronary heart disease commence in childhood? Medical Journal of Australia, April 6, 360-362.
- Goetz, J.P. & LeCompte, M.D. (1984). Problems of reliability and validity in ethnographic research. Review of Educational Research, Spring, 52(1) 31-60.
- Green, W.L., Kreuter, M.W., Deeds, S.G. & Partridge, K.B. (1980). Health education planning: A diagnostic approach. California: Mayfair.
- Health Department of Victoria. (1988). School canteen improvement program, Victoria: Government Printer.
- Health Department of Western Australia & Ministry of Education. (1987). Guiding principles: for the development of a school canteen nutrition policy. Perth: Government Printer.
- Hinkle, M.M. (1982). A mixed message: The school vending machine. Journal of School Health, January, 20-24.
- Hochbaum, G.M. (1981). Strategies and their rationale for changing people's eating habits. Journal of Nutrition Education, 13(1), 150-156.

Moller, J.H. (1982). Cardiovascular risk reduction. The problems facing the school age population. Health Education, January/February, 13-14.

National Heart Foundation. (1988). Heart Facts Report. Canberra.

National Heart Foundation. (1989). Update...On Diet and Heart Disease. Canberra.

National Health and Medical Research Council. (1988). Nutrition education in schools. Report prepared by the Public Health Committee, Canberra.

New South Wales Department of Education. (1987). The school health canteen policy. Sydney: Government Printer.

Newell, G., Howes, C., McEwan, N. & Newell, C. (1984). The role of the school canteen in outer Sydney suburbs. Journal of the Home Economics Association of Australia, 3(November), 22-28.

Nutbeam, D., Clarkson, J., Phillips, K., Everett, V., Hill A. & Catford, J. (1987). The health promoting school: Organisation and policy development in Welsh secondary schools. Health Education Journal, 46(3), 109-115.

Nutrition Link. (1988). School canteen report, Western Australia, Unpublished.

- Parahoo, A.K. (1984). Child nutrition - or adult indifference? Health Education Journal, 43(4), 93-96.
- Parcel, G.S., Simons-Morton, B.G., O'Hara, N.M., Baranowski, T., Kolbe, L.J. & Bee, D.E. (1987). School promotion of healthful diet and exercise behaviour: An integration of organisational change and school learning theory interventions. Journal of School Health, 57(4), 150-156.
- Perry, C.L., Mullis, R.M. & Maile, M.C. (1985). Modifying the eating behaviour of young children. Journal of School Health, 15(10), 399-402.
- Ports, V. (1989). School canteens, South Australia. Unpublished manuscript.
- Schoenberger, J.A. (1982). Why cardiovascular health education in the schools? Health Education, January/February, 15-16.
- Shannon, B. & Chen, A.N. (1988). A three-year school-based nutrition education study. Journal of Nutrition Education, 20(3), 114-123.
- Simons-Morton, B.G., Parcel, G.S. & O'Hara, N.M. (1988). Promote diet and physical activity at school. Health Education Quarterly, 15(1), 115-130.

Smith, S.F. & James, M.A. (1980). School lunch as a nutrition education resource for fourth graders. Journal of Nutrition Education, 12(2), 46-49.

Sum, E. (1987). Changing attitudes and habits of consumers towards foods purchased through school canteens. Unpublished manuscript.

Truswell, A.S. (1989). Recommended dietary intakes for use in Australia. Food Australia, July, 840-842.

Victorian School Canteens Association. (1988). It's up to you (video). Environmental Audio Visual.